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AGENCY FLOW OF INFORMATION

HEARINGS

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BEFORE THE

SUBCOMMITTEE ON
ADMINISTRATIVE PRACTICE AND PROCEDURE

OF THE

COMMITTEE ON THE JUDICIARY
UNITED STATES SENATE

NINETY-NINTH CONGRESS

FIRST SESSION

ON

EXAMINING OF AGENCY INFORMATION FLOW

JULY 23 AND 24, 1985

Serial No. J-99-42

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AGENCY FLOW OF INFORMATION

TUESDAY, JULY 23, 1985

U.S. SENATE,
SUBCOMMITTEE ON ADMINISTRATIVE
PRACTICE AND PROCEDURE,
COMMITTEE ON THE JUDICIARY,
Washington, DC.

The subcommittee met, pursuant to notice, at 1:30 p.m. in room SD-226, Dirksen Senate Office Building, Hon. Charles E. Grassley (chairman of the subcommittee) presiding.

Present: Senators Grassley and Specter.

Staff present: Kris Kolesnik, legislative assistant; Lisa Hovelson legislative assistant; and Veronica Gonzales, legislative aide.

OPENING STATEMENT OF HON. CHARLES E. GRASSLEY, A U.S SENATOR FROM THE STATE OF IOWA, CHAIRMAN, SUBCOMMITTEE ON ADMINISTRATIVE PRACTICE AND PROCEDURE

Senator **GRASSLEY**. I would like to welcome everybody to the hearing and say thank you very much for your kind interest in this subject.

I now call this hearing of the Subcommittee on Administrative Practice and Procedure to order, and tell you that this is a continuing examination on the part of this subcommittee of agency information flow.

Today we are looking at some specific information that is very important both to our national defense and to the Nation's taxpayers.

To explain this information, I would like to begin with a few recent quotes that are observations of our defense industry.

One former Pentagon official who will testify today says, and I quote:

> The problem here is that you've got too many people to accomplish the work that needs to be accomplished. The private nondefense industry won't put up with it. If you walk around plants in the competitive aircraft industry and walk into any defense contractor facility, you see a marked difference in the pace. It is not a competitive environment.

I would also like to quote a defense expert from England who says, and I quote:

> What you're seeing is socialism in action. Anyone who has studied a nationalized industry will recognize the problem. The difference is that in the case of the defense contractor, things are much worse. They have shareholders who are anxious to see big profits.

These comments are relevant because they relate to the testimony that we will hear today and tomorrow.

It is one thing to say that our defense system is a socialistic industry. It is another to prove it.

The kind of information we will examine today and tomorrow is capable of measuring the levels of defense efficiency and productivity.

I began to investigate defense contractor inefficiency last year, requesting cost and pricing data for labor, material and overhead on the Nation's major weapons systems.

The data I have collected show enormous discrepancies between the hours contractors say it should take to build a particular weapon, and the hours that it actually takes. The defense community and DOD say that these discrepancies are entirely justifiable, that they do not reflect quality control problems and bad management. Independent critics disagree. They say that the defense industry is inefficient and in fact is rewarded for that inefficiency.

One purpose of these hearings is to try to attempt to resolve this conflict that I have laid out. Should defense plants operate at normal efficiency, or are there legitimate excuses for their operations at 33 percent of normal efficiency, as the data I have collected indicates? Are we paying more for our defense than we should, or is this the justifiable price to pay for defending our country?

The other and more important purpose of these hearings involves the agency's handling or mishandling of this information. In attempting to gather work measurement data from the Department of Defense, certain barriers were constructed by DOD—barriers accompanied by intentional obfuscation which will be examined tomorrow.

I and others here in Congress have charged that the defense industry is fat, wasteful, poorly managed, and consequently contribution to an erosion of our national defense.

Many have called us grandstanders. The only way to resolve the dilemma is to open all the windows and examine all the facts.

Today begins the process of measuring and proving charges of defense factory inefficiency. Work measurement standards, are one key, and only one key, to this question. Time standards provide for us the most basic and empirical data for any such analysis and calculation. Today, this subcommittee intends to determine the relevance and importance of work measurement standards. Tomorrow, we intend to examine the role the DOD played in impeding congressional access to such information.

These hearings are a first step to getting everything out on the table, in full view of the public, and to openly debate the following question: Is our defense industy as efficienct and cost effective as it claims, or are defense contractors really welfare queens in Gucci shoes?

Now, I plead guilty to having called the defense industry "the new generation of welfare queens," and I intend to verify this right or wrong, through strictly empirical data and analysis.

If I am wrong, I stand corrected. But if I am right, these are ample grounds for this Congress and this country to undertake a wholesale disciplining of defense costs and budget input so that the taxpayers are getting all the defense they need, but at a much lower price.

Before I introduce the first panel, I would like to say that until 2 o'clock, caucuses of the two political parties will be going on, so we may not have other members present until then. But for the benefit of all who participate, the record will remain open for 15 days so that anybody who wants to correct any information or give additions can do that. It also gives my colleagues on the subcommittee the opportunity, if they cannot be here, to ask questions in writing and to receive a written response in that same 15-day period of time. It also gives the people who were not invited to testify the opportunity to submit information they want included on the presumption that it is not too voluminous or too costly to print.

Senator **Grassley**. I would now like to introduce our first panel of witnesses: Dr. Richard Engwall, manager of systems planning, analysis and assurance for the Defense and Electronics Center of Westinghouse Electric Corp. Dr. Engwall is here today representing Aerospace Industries Association.

We also have Mr. Donald Castle, consulting manager for H.B. Maynard and Co., Inc., located in Charlotte, NC.

As a matter of administrative practice we will include in the record your entire statement in hopes that you will summarize your testimony to a considerable extent.

So, I would ask that you would commence in the way that I introduced you and then I will ask questions to both of you after your presentations.

STATEMENT OF A PANEL, INCLUDING DR. RICHARD ENGWALL, MANAGER OF SYSTEM PLANNING, ANALYSIS AND ASSURANCE FOR DEFENSE AND ELECTRONICS CENTER OF WESTINGHOUSE ELECTRIC CORP., ON BEHALF OF AEROSPACE INDUSTRIES ASSOCIATION, ACCOMPANIED BY JOSEPH DOLLARD, DEPUTY GENERAL MANAGER, MANUFACTURING OPERATIONS DIVISION; AND DONALD CASTLE, CONSULTING MANAGER, H.B. MAYNARD & CO., INC., CHARLOTTE, NC

Dr. **Engwall**. Mr. Chairman and members of the subcommittee, I am Richard Lamont Engwall, manager of systems planning, analysis and assurance for the Defense and Electronics Center of Westinghouse Electric Corp. I am accompanied today by Mr. Joseph Dollard on my right, deputy general manager, Manufacturing Operations Division.

Today, I am appearing on behalf of the Aerospace Industries Association. I am currently chairman of the AIA Manufacturing Management Systems Group and chairman for the past 2½ years of the Productivity Improvement Committee.

I have spent 28 years in the industrial engineering profession, 20 years of which were in commercial industry. I have been very active in the Institute of Industrial Engineers, holding executive offices both at the local and national levels.

AIA appreciates the opportunity to provide insight from an industry point of view as to the proper role of time standards and work measurement in defense contracts.

We are here today to clarify the record regarding the remarks made when Senator Grassley offered his cost and price management amendment to the 1986 defense appropriation bill, and I quote:

> Our defense factories are operating at about 33 percent of normal efficiency. In other words, only 33 percent of our defense procurement dollars are being used efficiently. The other 67 percent is being wasted.

We disagree with Senator Grassley's conclusion, even though we agree with his findings that we are operating in total at about 33 percent of standard time. This is very good considering the point on the improvement curve where we are currently, particularly with recent emphasis on new, emerging state-of-the-art programs. This generally conforms to our forecasted hours at that point in the production schedule.

We want to explain to you those factors that make up manufacturing costs—what is standard time that we are being measured against, the improvement curve and those factors that contribute to the improvement curve and those factors that contribute to the improvement curve.

During the product life cycle there is no major performance difference between commercial and aerospace industry, except that most commercial industry companies achieve standard in a shorter period of elapsed time, due to significantly greater production volumes and rates, as well as more long-term program stability. Furthermore, commercial product and process technology and specifications are much less complex than in the defense industry. Specifically, the mission of defense products, for the most part, requires the use of new state-of-the-art materials and manufacturing processes to fit more engineering functionality into a smaller space of lighter weight and greater strength and with higher reliability and maintainability than in the commercial industry.

In addition, we will address the cost of work measurement which, in our opinion, adds little value to the product we manufacture, and in many instances, is being ineffectively imposed on us by the application of MIL-STD 1567-A (work measurement).

In many situations, it costs more money to measure performance than the cost of manufacturing the product itself.

AIA has been very involved in the national productivity community for some time. Starting in 1979, a formal effort to systematically develop better awareness and understanding of productivity challenges and opportunities in the aerospace industry was undertaken by AIA. AIA member companies have supported the Department of Defense's war on cost. Numerous productivity improvement and measurement initiatives have been established by the Department of Defense and in particular, Air Force Systems Command, to find ways to reduce cost, improve quality, and improve the acquisition process.

Industry is most interested in reducing cost while improving profitability. However, we are most concerned that work measurement not be legislated, which would most likely require costly documentation, regulations, and "how-to criteria."

Seeking cost-effective application of MIL-STD 1567-A has been foremost in our AIA activity. Since work measurement is really the focus of today's Senate hearing, let's discuss what standard time is.

Standard time is not "should cost" as it is being commonly referred to by a few, and which we are pointedly accused of not achieving. In layman's language, standard time is the time required for a fully trained worker to complete a defined element of work to known specifications, following a prescribed method, utilizing specific equipment, tools and material and workplace layout, and includes average personal time, fatigue time, and delay time allowances.

Standard time is theoretically achievable when rework and scrap are eliminated, all rate tooling is available, engineering requirements and manufacturing processes have stabilized, machine downtime is eliminated, manpower is perfectly matched to schedule requirements, parts and material shortage problems have been eliminated, and workers have become familiar with all aspects of the job.

If we view the typical improvement curve used in both commercial and defense industries, we find that in most instances, we cannot achieve standard, particularly in the early stages of high-complexity, low-volume, and low-rate production.

We have defined those elements that need to be addressed, many of which are beyond industry's control. For the most part they are of the nature and extent of the complex defense mission/product requirements, the rate and level of production needed, and the expediency with which new products and changes are introduced without sufficient producibility analysis being performed in advance of release of production.

In exhibit 6 in the written testimony, titled "Improvement Curve Factors Action Plan," we have defined those action plans needed to be accomplished by industry, by the Department of Defense and the legislative/executive branches of our Government to favorably influence reducing the realization factor toward the goal of manufacturing to standard time.

Many of the issues associated with the defense industry are regulations and standard practices that are not present in commercial industry, which enable commercial companies to achieve standards sooner than in the defense industry. If we—industry, the Department of Defense, and the legislative/executive branches of the Government—work together effectively, we can approach standard sooner, much like that being realized in commercial industry.

We appreciate the opportunity to express our views before your subcommittee, and we will now try to answer any questions that you might have.

Thank you.

Senator GRASSLEY. Thank you very much.

[Statement follows:]

PREPARED STATEMENT OF RICHARD ENGWALL

Mr. Chairman and Members of the Subcommittee:

I am Richard Lamont Engwall, Manager of System Planning, Analysis and Assurance for the Defense and Electronics Center of Westinghouse Electric Corporation. Today I am appearing on behalf of the Aerospace Industries Association, the trade association representing the nations major manufacturers of commercial, military and business aircraft, helicopters, aircraft engines, missiles, spacecraft and related components and equipment. I am currently chairman of AIA Manufacturing Management Systems (MMS) Manufacturing Technology Advisory Group (MTAG) and Chairman for the past two and half years of the Productivity Improvement Committee, which is one of the key projects that make up the MMS MTAG. I am also involved in the national industrial engineering and productivity community, currently serving the Institute of Industrial Engineers (IIE) as Chairman Special Productivity Projects. I am a senior member of the IIE, past chapter president, past director of the aerospace division, currently on board of directors of the Baltimore chapter of IIE, and have been a member of the management division and work measurement and methods engineering division of IIE for the the past 28 years.

AIA appreciates the opportunity to provide insight from an industry point of view as to the proper role of time standards and work measurement in defense contracts. We are here today to take issue with the testimony in the Senator Grassley amendment (S7187) to the 1986 Defense Appropriations Bill that quotes "Our defense factories are operating at about 33% of normal efficiency. In other words, only 33% of our defense procurement dollars are being used efficiently. The other 67% is being wasted."

We disagree with your conclusion but agree with your findings that we are operating in total at about 33% of standard time. This is, in our opinion, very good considering the point in the improvement curve that we are at, particularly with the recent emphasis on new emerging state-of-the-art programs. We want to explain to you those factors that make up manufacturing cost; and what is the standard time that we are being measured against, and commonly quoted as being inefficient if don't achieve at unit 1.

We will define the improvement curve, sometimes known as experience or learning curve or in estimating/pricing language is better known as the realization factor. In fact, we will compare commercial industry performance to our own defense industry performance. I personally have spent over 20 years in commercial industry and only the past 8 years in the defense industry. In some companies I was involved in both commercial and defense products for the same company. There is no major difference between commercial and aerospace industry performance except that most commercial industry companies achieve standard in a shorter period of elapsed time due to significantly greater production volumes and rates as well as more long term program stability. Furthermore, product and process technology/specifications are much less complex than in the defense industry. Specifically, the mission of defense products, for the most part, requires the use of new state-of-the-art materials and manufacturing processes to fit more engineering functionality into a smaller space, of lighter weight and greater strength, and with higher reliability and maintainability than in commercial industry.

Commercial industry uses the same improvement curve methodology as we do to estimate manufacturing start-up expenses incurred prior to achieving standard cost. This manufacturing start-up expense is applied accounting-wise to the same way that research and development, capital investment, and new product sales and marketing introduction expenses are amortized over the life of the product.

Even more importantly, we will define what actions we (industry) must take, and those actions that both the Department of Defense and the Congress/Executive branches of the government should take to expediate achievement of standard time. The aerospace industry is not 67% inefficient. In our opinion we are at least as good or better than commercial industry. There are many barriers, such as low production rates and volumes, program instability, "how to" regulations and specifications and complex mission requirements pushing the state-of-the-art technology, placed on us, many by you in the Congress, that prevent us from achieving standard. We would like to achieve standard time as much as you.

Secondly, we will address the cost of work measurement which in our opinion adds little value to the product we manufacture and in many instances is being non-cost effectively imposed on us by the application of MIL-STD 1567A (Work Measurement). In many situations it costs more money to measure performance than the cost of manufacturing the product itself. In fact, operator efficiency is only one of many performance evaluation factors that we use in measuring organizational effectiveness. Some include, Effectiveness, Quality, Productivity, Quality of Working Life, Innovation and Profitability.

The AIA has been very involved in the national productivity community for some time. Starting in 1979, a formal effort to systematically develop better awareness and understanding of productivity challenges and opportunities in the aerospace industry was undertaken by AIA. Through workshops and surveys, we have been assessing the extent that productivity improvement techniques and programs for both blue and white collar labor are being utilized in the defense industry. We undertook the study of the most cost effective productivity measurement systems for defense manufacturing. AIA member companies have supported the Department of Defense's "War on Cost". Numerous productivity improvement/measurement initiatives have been established by the Department of Defense and in particular Air Force Systems Command to find ways to reduce cost, improve quality and improve the acquisition process from both the Department of Defense and contractor's standpoints. Industry is most interested in reducing cost while improving profitability. However, we are most concerned that work measurement not be legislated, which would most likely require costly documentation, regulations, and "how to criteria", rather than macro level requirements that we can mutually cost-effectively apply to manage our factories. We have been using work measurement for some time as one of many tools to measure organizational affectiveness.

In July of 1983, the AIA conducted a Defense Industries Productivity Workshop. It was interesting to note that work measurement was not one of the key factors defined as having the most influence on productivity improvement in the Defense Industry. Those factors that held higher priority than work measurement to a national panel of productivity experts from academia, productivity improvement organizations, Department of Defense, Government Accounting Office, Department of Commerce, and industry were 1) national industrial policy, 2) networking/communications, 3) program stability, 4) producibility, 5) technology, 6) contracting and regulations, 7) incentives for productivity improvement, and 8) training and education. The comments made September 23, 1983 by Dr. D. Scott Sink, presently Director Virginia Productivity Center moderator of our Defense Industries Productivity Workshop, at the White House Conference on Productivity are included in our report as

Exhibit 1. Similarly we have included the Executive Summary of the Final Report as Exhibit 2. Copies of the full report may be obtained through AIA.

Seeking cost-effective application of Mil-Std 1567A has been foremost in our AIA MMS MTAG activity. Since work measurement is really the focus of today's Senate hearing, let's discuss what standard time is. Standard time is not "should cost", as it is being commonly referred to by a few, for which we are pointedly being accused of not achieving. The industrial engineering definition of standard time is "the time determined by accepted Industrial Engineering techniques required by qualified operator, displaying normal skill and effort, encountering normal delays and fatigue under capable supervision, and following the prescribed method to complete a defined amount of work to a specified quality level. This time is normally factored to include allowances for personal, fatigue and unavoidable delay time."

In layman's language standard time is the time required for a fully trained worker to complete a defined element of work, to known specifications, following a prescribed method, utilizing specific equipment, tools, material, work place layout and includes average personal, fatigue and delay time allowance.

Standard time is theoretically achievable when rework and scrap are eliminated, all rate tooling is available, engineering requirements and manufacturing processes have stabilized, machine downtime is eliminated, manpower is perfectly matched to schedule requirement, parts/material shortage problems have been eliminated, and workers become familiar with all aspects of job. Work needs to be repeated in a stable environment many times, e.g., 100's to 1000's.

In fact, this is defined as Exhibit 3, attached for your reference.

If we view the typical improvement curve used in both commercial and defense industries, we find that in most instances we can not achieve standard, particularly in the early stages of high complexity, low volume, and low rate production. Three major factors need to be reduced if we are to approach standard time- learning, logistics, and technical. Please find Exhibit 4 titled "Typical Improvement Curve" and Exhibit 5 "Improvement Curve Factors" that define those factors that need to be reduced, many of which are beyond industry's control. For the most part they are of the nature and extent of our complex defense mission/product requirements, the rate and level of production needed, and the expediency with which new products are introduced without sufficient producibility analysis being performed in advance of release of production.

In Exhibit 6 titled "Improvement Curve Factors", we have defined those action plans needed to be accomplished by industry, the Department of Defense, and the Congress/Executive branches of our government to favorably influence reducing the realization factor towards the goal of manufacturing to standard time. Many of the issues associated with the Defense Industry are regulations and standard practices that are not present in commercial industry, which enable commercial companies to achieve standard sooner than in the Defense Industry. If we (industry, Department of Defense, and the Congress/Executive branches of the government) work together effectively, we can approach standard sooner, much like that being realized in commercial industry.

Please find as Exhibit 7 definitions of terms used as stated in Industrial Engineering Terminology Book ANSI Standard Z94.0-1982. Similarly key definitions are presented as Exhibit 8, as defined in the Industrial Engineering Handbook the third edition, and in Exhibit 9 titled "Realization Factor Bibliography", which is the bibliography for a study being conducted by AIA to more fully understand the realization factor/improvement curve phenomenon.

STANDARD TIME

Standard time assumes a fully trained operator is available. Operator learning is based on process, methods and product familiarity. Process familiarity is that time required to train an operator in the basic skill requirements of the type of work being performed, sometimes included in overhead. Methods Familiarity is that number of repetitive cycles for an average operator to become sufficiently familiar with a specific method to be able to perform at standard. A certain amount of this learning may be transferred with an operator who starts to perform work which is similar to a previous job. Product Familiarity is that number of repetitive cycles for an average operator to apply the process skill acquired and methods familiarity to perform a standard operation on a specific item. The more complex the product, the greater the number of items, the longer the cycle time, the longer to learn. The defense industry products are more complex, have a greater number of items, average operation cycle times are longer, production rates and volume are significantly less than commercial, therefore, take a longer time period to achieve standard.

The defense industry average operation cycle time of AIA member companies participating in a recent work measurement survey is 16 minutes for an average fabrication operation, (e.g. drill, mill, lathe, press), 90 minutes for an average assembly operation and 25 minutes for an average test operation. However, the standard deviation of this average is very significant due to the broad range of product that is manufactured in the defense industry from aircraft to missiles to electronics to engines to space products, with significantly different product/process complexity, rates and volume.

For the most part commercially accepted predetermined time standard data accuracy and reliability criteria is based on a 2 minute average cycle time which is significantly less than experienced in our industry. The complexity of the operation, length of job cycle time, redundancy of identical patterns of motions done repeatedly in the course of performing the operation, and process capability to meet design requirements, all influence the ability or inability to use normal standard methods level of learning proficiency for defense industry products.

IMPROVEMENT CURVE FACTORS - LEARNING

In fact, in the development of MTM predetermined time standard data four levels of method proficiency are recognized. The normal standard methods level that standard time is established at is based on performing simultaneous manipulations during the reach move. The low methods level, which is 169% of normal standard time, is based on sequential (single hand) moves, no manipulation action during the reach move. The high methods level, which is 138% of normal standard time, requires simultaneous two hand moves, no manipulation actions during the reach move. The optimum methods level, which is 94% of normal standard time, is based on higher class actions using the eye, brain, and or ear to be accomplished during the reach move.

As stated in MTM research literature, the improvement in performance (reduction in cycle time) for manual work results from a combination of classical and instrumental conditioning achieved by the practice of motor skills made significant by perceptual input within the information processing capability of the learner. Until the perceptual capacity of the manual learner has progressed, usually by a process of instruction followed by trial and error practice, to the point at which the learner can perform a task unaided and without hesitation, the learners performance will be in the threshold area. Having crossed this barrier into the reinforcement region, the manual learner repeats enough task cycles to develop movements automatically. When the rate of cycle performance reaches that required by an average operator within average skill under average conditions, the standard MTM time is achieved.

It is unreasonable to think that an operator can achieve normal standard methods level without repetitive production experience. We use the term in the defense industry that standard time is achievable at the 1000th unit. In commercial industry application, with an average 2 minute cycle time, 1000 units represent 33.3 hours or one week elapsed time. Conversely for our average assembly cycle time, (90 minutes standard time) 1,500 hours or a minimum of 9 months is required of repetitive production to achieve the status of a fully trained worker.

Loss of learning due to break-in production continuity occurs more frequently in the defense than in commercial industry. The commonly accepted Anderlohr theory recognizes the changes from prior production that occur due to breaks in production that involve operator learning and supervisory learning as well as those changes in methods, tooling and plant layout that adversely impact achieving prior cost performance.

IMPROVEMENT CURVE FACTORS - LOGISTICS

The following logistics factors contribute to failure to achieve standard time include; parts availability, manufacturing complexity, production rates, schedules and machine availability/facility layout:

Parts Availability - Numerous times the industry is producing parts using new or recently developed processes or techniques which take time to settle down into a routine. As the engineering design matures through verification of achieving mission requirements the number of design changes and fixes reduces dramatically. During the production cycle, there are times whereby tool breakdowns or wear and tear can impact the continuous work flow. Inadequate time to procure material resources can influence the continuous work flow. Because of the low quantity requirements and more demanding production specifications for parts procured for the defense industry relative to commercial and/or consumer industry, vendors place lower priority on our needs relative to schedule availability. Due to the complexity of items produced, there is a high variability in the process yield which is difficult to forecast. The employee skill levels, state of art influences on process capability, design maturity and tool problems can all impact the parts supply.

Manufacturing Complexity - Company and customer inspection availability cannot always be coordinated perfectly with the production mechanic. The availability of hardware, parts, power/hand tools, assembly tools and assembly paperwork must be optimized to achieve standard. The production operation sequence data package must have the necessary specification callouts and operation sequence which reflects the most efficient operation.

Production Rates/Schedules - The coordination of unit cost reduction and production rate build-up must be in concert in order to minimize manpower requirement fluctuations. Production cycle variations which are increasing and/or decreasing from a requirement standpoint cause inefficient manpower utilization. The stops and restarts of terminations and gaps in the product life cycle cause a relearning process and a loss of progress in the improvement curve.

Machine Availability/Facility Layout - There are cases where machines unexpectedly breakdown and/or are not available to higher schedule priorities (e.g. DX priority), which causes production to move to less efficient machines. Due to the uncertainties of future work, the most efficient plant layout must be developed and reevaluated due to constant changes to avoid congestion, improve work flow, and best utilize space.

IMPROVEMENT CURVE FACTORS - TECHNICAL

Technical factors contributing to failure to achieve standard time include engineering, planning/tooling and quality all impacted by the state-of-the-art technology, product complexity, and producibility related issues.

The lack of realism during the initial development contract acquisition process causes a large measure of our technical functionality/producibility problems. We start with the generation of performance requirements by the government without the tracking of mission requirements against the "ilities" (affordability, producibility, supportability, maintainability). There is a need to compare performance requirements against other program constraints.

Unfortunately, because of lack of time and funding, front end planning is often neglected. The people needed to adequately man the program are never immediately available, thus everyone starts out behind the power curve. Considerations such as standardization, value engineering, producibility, make or buy, etc., are frequently postponed in the rush to maintain schedule. However, it is imperative to bring design and manufacturing engineering personnel, both at the prime contractor and subcontractor level, into the front end of the program to focus on producibility.

Working at the end of the rapidly changing state of the art in the defense technologies bring about another series of producibility constraints. Numerous change notices disrupt the manufacturing cycle. Advances in the state of the art cause diminishing manufacturing sources which lead to redesign and work-around problems. Tooling, processes and people become obsolete much faster in the dynamics of the systems and requires continuous retraining of personnel. The lack of technical stability makes producibility enhancement difficult and manufacturing and test optimization impossible.

In the defense industry we are pushing the state-of-the-art in using new materials, products and/or innovative use of existing materials and products such as adhesives, powdered metal, superplastics, composites, monolithic circuits, very large system integration (VLSI), and built-in test capability. Similarly, we are in the forefront in implementation of computer-aided design/computer-aided manufacturing (CAD/CAM) systems, and the automation of machines and processes through the use of direct numeric control (DNC), computer numerical control (CNC), flexible manufacturing systems (FMS), robotics, material handling systems and others.

Design changes result in tooling changes, process specification changes, product flow changes, worker unlearning and relearning, rework of units/parts built to early configuration, work stoppages pending revised paperwork and components, materials, expendables not available and/or not to specification. These design changes are caused by unpredictable design, tolerance stackups, early start-up of production (i.e. prior to completion of design verification) and lack of funding, time, and/or front end emphasis on producibility versus functionality of the design. We need to budget more time and money up front, prior to product design.

Tooling/planning problems create rework and repair caused by tools improperly designed/built, rework caused by process planning errors/wrong callouts, and alternate/work around methods (e.g. open setups versus jigs/fixture, conventional operations versus numerical control, single spindle versus multiple spindle, layout versus templates, labor intensive operations versus automation and tool liaison interruptions).

These tooling/planning changes are caused by:

Schedule Constraints

- Tools designed from preliminary engineering releases
- Lead time for tool fabrication
- Time availability for tool-proofing
- Inflexibility of schedule changes

Funding Constraints

- Producibility review of tool designs
- Expense tooling budgets
- Automation capital availability

Business Constraints

- Peaks and valleys in requirements for highly skilled workers in planning, tooling, and first article inspection.

Unclear and/or unrealistic quality acceptance criteria results in useable hardware being rejected, excessive and/or redundant inspection buyoffs and added rework and reinspection costs being incurred. These quality changes are caused by a low confidence factor on new product, unclear product requirement criteria, part/product complexity, process capability versus state-of-art designs and incomplete training - new workers, new products/processes.

MIL STD 1567A (WORK MEASUREMENT)

One of the major concerns that AIA member companies have is the cost of work measurement relative to the benefits gained. We fully support the use of cost effective work measurement systems. In fact at a recent work measurement meeting conducted by Charles Hooper, Director of Manufacturing OCS/Product Assurance and Acquisition Logistics, Department of the Air Force Headquarters AFSC, practically all of our member companies were present. On 20-21, February, 1985, our top management from 32 companies were invited by General Lawrence A. Skantz, USAF Commander Air Force Systems Command to Kirtland Air Force Base to address work measurement. General Skantz has been and continues to push industry to implement cost effective work measurement to serve as a management tool to improve productivity and reduce costs. At the Kirtland meeting, each company presented its position relative to implementing MIL-STD 1567A, its comments, concerns and recommendations to the proposed DoD Application Guide for MIL-STD 1567A (Work Measurement) and its experience with recent Contractor Operations Review (COR) audits. The following consolidated industry position was presented as follows:

I. General

- A. Work measurement (MIL-STD 1567A) concept (objective), is good
  - 1. Disciplined system to improve efficiency and productivity
    - a. Objective performance measurement
    - b. Efficiency improvement
    - c. Methods engineering to reduce standard hour content
    - d. Valuable input to cost estimating
  - 2. Most contractors already have work measurement system meeting the intent of MIL-STD 1567A.
    - a. Reducing costs
    - b. Improving productivity
- B. But current AFSC emphasis on MIL-STD 1567A is inappropriate
  - 1. Direct labor is a small percent (10 to 20%) of total cost and growing smaller.
  - 2. Direct labor already most measured element of cost.
  - 3. Other cost reduction initiatives have more potential.
    - a. Overhead reduction
    - b. Producibility engineering and planning
    - c. Low risk transition to production
    - d. Factory of the Future efforts
      - (1) IMIP/MANTECH
      - (2) Quality improvement initiatives
      - (3) Work-in-process inventory reduction
      - (4) Participative management
        - (a) Cross training
        - (b) Work sharing
- C. Recommendations
  - 1. Emphasis/funds would be better spent on "step function" improvements that encourage factory modernization.
  - 2. MIL-STD 1567A should be recognized as one of a group of thrusts which should be treated as a whole (i.e. "total cost" management).
  - 3. Administration should be flexible.
    - a. Avoid conflicting objectives
    - b. Permit rewarding contractor performance
    - c. Control administrative costs

II. Inconsistent Department of Defense intent

  A. Army/Navy/Air Force approaches vary. Joint Service Agreement on Support of MIL-STD 1567A, Work Measurement, signed 8 February, 1985.

    1. Air Force encouraging widespread contractual application. Army/Navy appear to be applying on an "exception basis".

    2. Air Force using MIL-STD 1567 criteria to evaluate contractor performance when MIL-STD is not on contract.

    3. Spreading costs into overhead impacts non-participating programs.

      a. Other Department of Defense programs which are unwilling to pay upfront costs impacted anyway

      b. Non-Department of Defense (including commercial) programs impacted

      c. Near term equity issue in that backlog prevents true forward pricing

    4. Putting costs into overhead contrary to initiatives to reduce overhead and indirect costs.

  B. Recommendation

    1. Contractually apply MIL-STD or accept the contractor's system.

    2. Implementor (customer) should directly pay all costs.

III. Department of Defense Application Guide unacceptable

  A. Purpose of guide was to provide non-contractual uniform guidance for interpretation, not application, of MIL-STD 1567A.

    1. Proposed guide appears to be contractual.

    2. Proposed guide goes far beyond interpreting MIL-STD 1567A provisions.

      a. Inappropriately extends definitions

        (1) Operations analysis

        (2) Touch labor

      b. Forces variance analysis to micro levels

      c. Discourages/eliminates cost-effective tailoring/validation

    3. Term "work center" needs clarification

    4. Air Force/Department of Defense has been unresponsive to previous industry comments/concerns for cost effective implementation.

B. Recommendation

1. DoD Application Guide should be rewritten.

a. Provide criteria in lieu of detailed "how to" guidance

b. Limit scope to that of MIL-STD 1567A

IV. MIL-STD 1567A Concerns

A. AFSC policy not consistent with MIL-STD

1. Policy discourages waiver/tailoring

a. MIL-STD Forward appears to encourage same.

b. Central issue should be cost/benefits analysis.

2. Recommendation

a. Encourage cost-effective program office tailoring. Program office should have to justify benefits prior to contractual application.

b. Change application thresholds to levels that will require fewer waivers.

(1) Increase financial thresholds

(2) Consider exempting low quantity production

B. Subcontractor flowdown provisions should be reevaluated

1. Prime contractors don't have resources to validate subcontractor systems. Significant cost impact.

2. Recommendation

a. Re-examine dollar thresholds/appropriate criteria.

(1) Increase financial thresholds

(2) Exclude FFP contracts

b. More flexibility to tailor subcontractor requirements necessary.

C. Too much emphasis on compliance to specific MIL-STD provisions in lieu of performance improvement

1. Government evaluators primarily concerned with mechanics of work measurement system.

a. Precise labor standards (± 10% accuracy with 90% confidence level) not an end in themselves.

b. Excessive documentation to support:

(1) Standards setting

(2) Operations analysis level

(3) Variance analysis level

2. Recommendation
   - a. Emphasis should be on results.
     - (1) Performance index trends
     - (2) Standard hour reduction
     - (3) Macro level measurement
   - b. Allow documentation requirements to be negotiated at local level.
   - c. Standards for low volume, long cycle operations should not be required to achieve ± 10% accuracy with 90% confidence level.
   - d. Work sampling should be an acceptable technique to develop Type I standards.

We are encouraged by recent information exchange with AFSC to strive to reestablish our industry views that we fully support General Skantz in seeking to find mutually cost effective ways to utilize work measurement as a tool in helping to reduce cost and improve performance. However, we are conversely concerned with the accusations made by Congress and others that incorrectly label our industry as being inefficient. We are proud of our continuing cost improvement of stable programs. Conversely, we are pushing the state-of-the-art in our industry, much of which accounts for not achieving standard time at unit 1. Even more importantly, we feel there are more important actions needed to reduce costs, as defined in Exhibit 6.

COST OF WORK MEASUREMENT

From a recent AIA work measurement survey the engineering hours required to develop type I standards range from 15 to 80 hours for fabrication (drill, mill, lathe, press) operations, 6 to 100 hours for assembly operations and from 10 to 100 hours for test operations. The significant range in times is due to the impact of product differences defined above and the range of work measurements systems employed from work sampling, time study, manual predetermined time systems, to the most recent computerized work measurement systems that are now just becoming available.

Assuming an average of 50 hours engineering time per one standard hour and that work measurement costs should not exceed 10% of the manufacturing cost 500 units would have to be produced to recover the cost of work measurement. Our information shows that engineering cost for the developing type II standards is approximately 20% of type I standards. MIL-STD 1567A (Work Measurement) presently requires 80% coverage by type I standards.

Similarly we have reviewed the total implementation cost for an administration control, computer and work measurement systems cost for installation and maintenance of MIL-STD 1567A as well as the piece part accountability reporting being considered by some forces,. In our opinion the cost of work measurement regulations and standards being imposed is becoming prohibitive.

WORK MEASUREMENT COST PER FACILITY (MILLIONS OF DOLLARS)

	Install	Maintain	Piece Part Accounting
Administration	0.3 to 0.6M	0.3 to 0.6M	0.6 to +1.2M
Control	3 to 20M	1.5 to 10M	1.0 to 2.5M per/ Program (contract)
Computer	(0.1 to 0.8M)	)	+0.5 to 2.5M
Work Measurement Systems	(0.5 to 1.5M	)	+0.5 to 2.0M

We appreciate the opportunity to express our views before your subcommittee and will now try to answer any questions you might have.

List of Exhibits

1. White House Conference on Productivity Statement
2. Defense Industry Productivity Workshop Final Report Executive Summary
3. What is A Standard
4. Typical Improvement Curve
5. Improvement Curve Elements
6. Realization Factor/Improvement Curve Action Plan
7. IE Terminology Definitions
8. IE Handbook Definitions
9. AIA Realization Facter Study Bibliography

EXHIBIT 1

WHITE HOUSE CONFERENCE ON PRODUCTIVITY

Comments made by Dr. D. Scott Sink on behalf of the
Defense Industries Productivity Workshop
Friday, September, 23, 1983

I am Scott Sink, Director of the Oklahoma Productivity Center and Professor in the School of Industrial Engineering and Management at Oklahoma State University.

I am very pleased to have the opportunity to be a spokesperson for the Defense Industries Productivity Workshop. This workshop was held in July as an effort to provide necessary input for this WHCP from a sector of the economy that represents the second largest component of the GNP.

This industry has been and will continue to be an extremely pervasive and critical element of our economy. In many respects the industry represents an important component of what Alvin Toffer has called the Third Wave. Technological innovation stemming from activities in defense related industries are numerous and the potential for productivity gains through technology transfer to other elements of the private sector has always been excellent.

Aside for the political questions of how much money will be allocated to defense and where the money is to be spent, the effectiveness and efficiency with which those resources are employed is perhaps the most critical challenge facing our country today. Obtaining the biggest bang for the buck is a very salient issue in the defense industry in more ways than one.

The Department of Defense is the designer and customer with industry being the manufacturer. This rather unique relationship heightens the need for improved communication, coordination and cooperation between these parties in an attempt to continue to reduce acquisition costs and to improve contractor productivity and profitability.

Managers in Defense related organizations have been cognizant of the productivity challenges facing them for many, many years and if there is one industry that has proven its ability to rise to challenges it is this one. Work on productivity enhancement is and has been underway constantly. However, this WHCP seemed an opportune time to readdress critical productivity related issues facing the industry.

With the Pittsburgh Preparatory Conference and this WHCP in mind, 29 key Productivity experts from: academia (faculty from universities such as The Ohio State University, North Carolina State, University of Maryland, and Oklahoma State University were in attendance); Regional Productivity Centers which are members of the National Productivity Network that Dr.Rudy Yobs mentioned just before lunch such as the Maryland Center for Productivity and

Quality of Work Life, the Productivity and Quality of Worklife, the Productivity Research and Extension Program at North Carolina State and the Oklahoma Productivity Center at Oklahoma State University were present; productivity related associations and societies such as the Institute of Industrial Engineers, American Productivity Managers Association and the American Productivity Center were represented; numerous government organizations such as the DoD, Departments of Commerce, Navy, Air Force and Army were present as well as the GAO; and, of course Defense related private sector firms such as Boeing, Honeywell, Lockheed, Grumman, GE, Westinghouse, Bell Helicopter, General Dynamics, TRW, Hercules, and Hughes were present. This heterogeneous group of productivity experts and experienced practitioners met at the APC in Houston to develop a report and recommendations to present at this WHCP. The Aerospace Industries Association supported the endeavor and Mr. Richard Engwall of Westinghouse chaired the workshop, I developed and facilitated the sessions, and Carl Thor of the APC hosted the meeting.

The final report, which has been widely distributed during the past two months, is succinct and rich with critical insights on how productivity can be continued to be improved in the Defense Industry during the next 1-10 years. This workshop was not a computer conference but a highly structured series of group processes in a workshop setting. The Nominal Group Technique was utilized extensively to ensure achievement of consensus among this interdisciplinary and heterogeneous group of productivity experts.

The participants identified and prioritized over fifty unique strategic issues as well as more immediate action items that will or can positively influence productivity in this industry in the next decade. The final report which documents the workshop process and output in detail, lists and discusses these consensus perceptions and recommendations.

Much is being done in the U.S. today to better manage productivity and to assure that the recovery that at least part of our economy is experiencing can be sustained. William Simon and other prestigious speakers here have spoken of favorable changes such as:

- improved production control
- advancing technological innovation
- more effective quality management
- exciting new and more effective relationships between labor and management
- improved Socio-Technical Systems Design

- and incentives systems design and development at the micro, intermediate, and macro levels. Admiral Sansone will speak to you next about an exciting DoD program called Industrial Modernization Incentives Program.

- And, despite the fact that little mention has been made of it, progress is being made in the area of productivity measurement at the firm level and below. As Peter Drucker so precisely stated it:

> "Without Productivity Objectives, an organization has not direction; Without Productivity Measurement, it has not Control".

In conclusion, the Defense Industry is extremely proactive in regards to productivity management. Many if not most companies in the industry are truly in search of excellence. Much remains to be accomplished since we know that certain elements of this industry are strategic targets for Japanese Industry, however, we are confident that the productivity challenges we face in the 80's, 90's and beyond will be met and exceeded by the management and employees of this vital industry.

EXHIBIT 2
DEFENSE INDUSTRIES PRODUCTIVITY WORKSHOP
FINAL REPORT
EXECUTIVE SUMMARY

Aside from the political questions surrounding how much money is spent on defense and in what places, the effectiveness and efficiency with which those resources are employed is perhaps the most vital challenge facing our country today.

Recognizing this challenge, on July 13 to 15, 1983, 29 key productivity experts from academia, professional productivity related organizations, DoD, Government and Industry met at the American Productivity Center in Houston, Texas to address productivity improvement issues within the Defense Industry. This workshop was initiated to address both national and Defense Industry concerns regarding productivity. The Defense Industry is vital to the U.S. Economy, being the second largest contributor to Gross National Product. This industry is often highly dependent upon Government/DoD as the designer (requirements definition), manufacturing supplier (government furnished equipment/material), and sole customer. The Defense Industry productivity issues and concerns impact the Private Sector as well as Government Organization and Operation, the Role of Government in the economy; the Capital Investment; and, the Human Resources Preparatory Conferences.

Numerous associations, societies, centers, as well as specific firms have been and continue to be concerned about productivity. These organizations have attempted to come to grips with the existing problems and opportunities in a variety of ways. The White House Conference on Productivity and the many productivity conferences preceding it have certainly served to shape and crystallize thinking about what productivity is, how it can be measured, evaluated,controlled, and improved.

The Conference was chaired by Richard L. Engwall, Westinghouse Electric Corporation, Aerospace Division Director of Institute of Industrial Engineers, and Chairman of Aerospace Industries Association MTAG MMS Committee on Productivity. Dr. D. Scott Sink, Associate Professor at the School of Industrial Engineering and Management, Oklahoma State University and Director of the Oklahoma Productivity Center served as Moderator. Carl G. Thor, Vice President - Measurement American Productivity Center and Dr. George L. Smith, Jr., Chairman Industrial and Systems Engineering Department of Ohio State University joined Dr. Scott Sink as Workshop Facilitators. The results of that vital workshop are being summarized herein and are presented in their entirety in a final report of which this executive summary is a part.

This executive summary and the final report are intended to be succinct, clear, and rich with critical insights on how productivity can be improved in the Defense Industry during the next 1 - 10 years. A quick glance at the roster of attendees, which is enclosed, will provide an appreciation for the quality of the workshop output which appears in the complete final report.

Our subject conference was different from most other Government/DoD/Industry Conferences in that a top down structured approach was taken to productivity improvement by a selected group of productivity experts. These experts represent manufacturing operations top management (policy makers), manufacturing technologists, industrial engineers, behaviorists, productivity managers, and the leading productivity organizations in the country - Institute of Industrial Engineering, State and Regional Productivity Centers; Academia (productivity experts), American Productivity Center, American Productivity Management Association, and Government/DoD Productivity Offices, Industrial Modernization Incentives Program representatives as well as the Government Accounting Office.

The Nominal Group Technique was purposefully selected as a structured group process to be utilized to obtain consensus from a heterogeneous group on a complex subject. Workshop participant heterogeneity ensured balanced viewpoints on the issues, problems, and opportunities in terms of both the strategic as well as shorter term perspectives. Most attendees have spent a good portion of their careers in the industry and understand, in a very pragmatic sense, the factors affecting productivity. The workshop agenda, also enclosed, was designed to ensure efficient and effective use of these people's valuable time. The design also assured attainment of consensus so that explicit recommendations could be made to the White House Conference on Productivity (WHCP).

The sentiments of the participants at the end of the two and one-half day workshop were strong and clear as to what should be done with the results. A majority of the people at the Conference felt that from a management standpoint we need to "Get Back to Basics", concentrate on Quality, Productivity, and a variety of other basic performance criteria simultaneously, focus on improved labor/management relations getting everyone involved at all levels within an organization in a participative way to work together to improve quality and productivity. Therefore, this Defense Industries Productivity Workshop concentrated on those productivity issues and concerns which require coordinated Government/DoD/Industry/University actions. Consensus was that the results must be presented and heard at both the Private Sector Initiatives Preparatory Conference in Pittsburgh as well as at the actual White House Conference in Washington. This Executive Summary package contains brief highlights of the conclusions and consensus gained in Houston by the distinguished and experienced group of manager, academicians, and government leaders. The entire Final Report is being submitted to the WHCP staff at the Pittsburgh conference. The Final Report will also be resubmitted at the September WHCP in Washington.

The logic and sequence of activities for the agenda of the Workshop are described and outlined in the enclosed material. The workshop attendees were asked to identify and prioritize longer term or strategic factors or issues affecting productivity in the Defense Industry. Small groupings of these participants then clarified and discussed in some detail the key issues influencing productivity in their industry. Representative key issues identified are presented below:

- The number of and effectiveness of incentives programs designed to enhance or spark productivity improvement efforts.
- The rate of and effectiveness of implementation of new technology.
- The explicitness and comprehensiveness of our national industrial policy.
- The appropriateness and effectiveness of newly promulgated regulations. The dysfunctional impact of existing regulations and statues.
- Management philosophies and attitudes regarding productivity.
- Program stability.
- Design/manufacturing interface with respect to producibility considerations.

- Personnel skills and abilities.
- Industry, academia, government, congress, labor cooperation.
- Generic applied manufacturing research.

(note: the participants generated approximately fifty unique issues affecting productivity in the Defense Industry which will be included in the final report. Those listed above represent the top ten consensus priority facing this country and this industry in particular.)

On the second day of the workshop, participants were asked to shorten their horizon of thinking and to identify and prioritize specific action programs/recommendations that should be initiated within the next year which would positively affect productivity in the Defense Industry if effectively implemented. Representative action programs/recommendations are presented below:

- Establish a formal communication network for the purpose of focusing, addressing, and acting upon Defense Industry productivity problems and opportunities.
- Increase the number of and quality of efforts to facilitate application of advanced manufacturing technology.
- Improve the design/manufacturing interface with regards to producibility and other cost effectiveness trade-offs.
- Make Government a more reliable customer by improving program stability.
- Establish training and education initiatives to increase the quality and quantity of engineers, scientists, technicians, and managers. Retrain employees displaced by advanced technology. Establish joint workshops to train Government/DoD Industry personnel how to effectively and efficiently work together for a common goal.
- Initiate a National debate on the need for an Industrial Policy.
- Improve the contracting and acquisition process.
- Improve the effectiveness of incentives to improve productivity. Facilitate contractor investment to reduce life-cycle acquisition cost for DoD.

(Note: The participants generated well over fifty unique action programs/recommendations presented in this Executive Summary. Readers are urged to read the entire report so as to gain a full appreciation for what transpired at this vital workshop.

The White House Conference on Productivity may well serve to finally and appropriately elevate National awareness as to the significant challenges facing the U.S. in the area of Productivity in the coming decade. We hope that the input provided from the Defense Industries Productivity Workshop plays a prominent role in the establishment of more effective policies and practices.

EXHIBIT 3

WHAT IS A STANDARD?

(Commercial and Defense Industries)

- The time required for a fully trained worker:
  - To complete a defined element of work
  - To know specifications
  - Following a prescribed method
  - Utilizing specific
    Equipment - Tools - Material - Work Place Layout
  - Includes average personal, fatigue and delay time allowance

- Theoretically achievable when:
  - Rework and scrap are eliminated
  - All rate tooling is available
  - Engineering requirements and manufacturing processes have stabilized
    No design changes
    No tooling changes
    No method changes
  - Machine downtime is eliminated
  - Manpower is perfectly matched to schedule requirement
  - Parts/material shortage problems have been eliminated
  - Workers become familiar with all aspects of job
  - Work has been repeated in a stable environment many time, e.g., 100's to 1000's

EXHIBIT 4

TYPICAL IMPROVEMENT CURVE

Commercial and Defense Industries

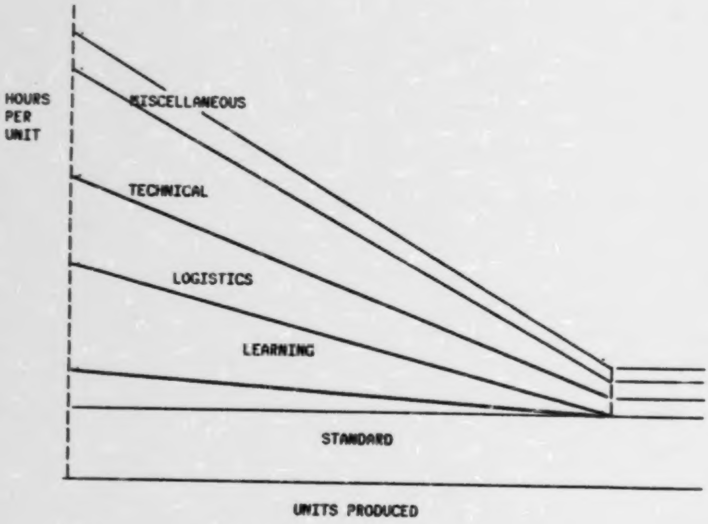
HOURS PER UNIT
MISCELLANEOUS
TECHNICAL
LOGISTICS
LEARNING
STANDARD
UNITS PRODUCED

EXHIBIT 5

IMPROVEMENT CURVE FACTORS

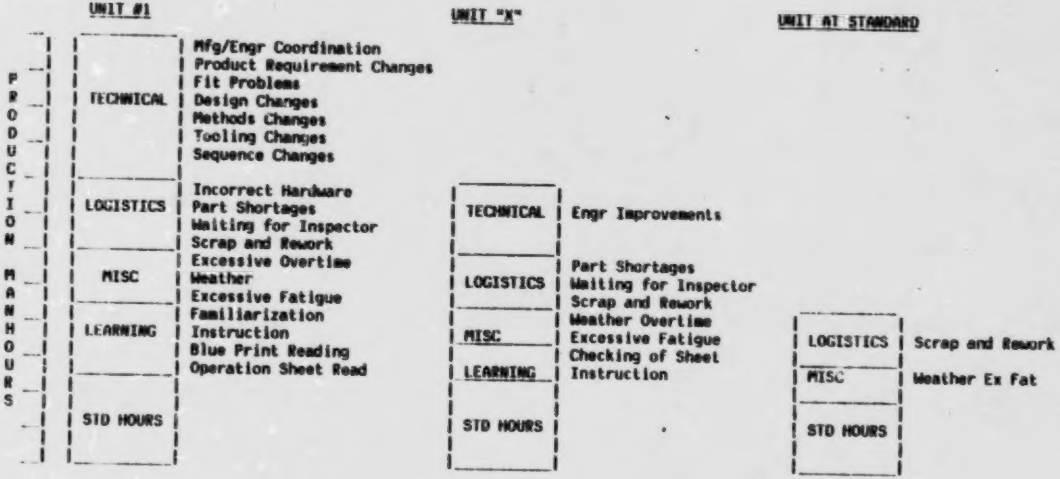
UNIT #1
UNIT "X"
UNIT AT STANDARD
PRODUCTION MANHOURS
TECHNICAL
Mfg/Engr Coordination
Product Requirement Changes
Fit Problems
Design Changes
Methods Changes
Tooling Changes
Sequence Changes
LOGISTICS
Incorrect Hardware
Part Shortages
Waiting for Inspector
Scrap and Rework
MISC
Excessive Overtime
Weather
Excessive Fatigue
LEARNING
Familiarization
Instruction
Blue Print Reading
Operation Sheet Read
STD HOURS
TECHNICAL
Engr Improvements
LOGISTICS
Part Shortages
Waiting for Inspector
Scrap and Rework
MISC
Weather Overtime
Excessive Fatigue
LEARNING
Checking of Sheet
Instruction
STD HOURS
LOGISTICS
Scrap and Rework
MISC
Weather Ex Fat
STD HOURS

EXHIBIT 6 — REALIZATION FACTOR/IMPROVEMENT CURVE ACTION PLAN

TOUCH LABOR ELEMENTS	GOVERNMENT		INDUSTRY
	CONGRESS/EXECUTIVE	DEPARTMENT OF DEFENSE	
STANDARD LABOR	5 Year Budget Establishment Multi-year Procurement Funding Level of DoD Funding	IMIP	Invest in Automation and/or FOF Facilities
	Reduce redundant inquiries	Apply MIL STD 1567A Policy Requirements not "How to"	Implement Cost Effective Work Measurement Program
	5 Year Budget Establishment Multi-year Procurement Funding Level of DoD Funding	Smooth Program Plan	Production Rate Stability/Smoothening
	--------	Streamlining Initiative	Improve Methods/Processes
	Simplify OSHA Regulations	--------	Safety Environment
	5 Year Budget Establishment Multi-year Procurement Funding Level of DoD Funding	Fund Time/Money	Producibility
LEARNING	5 Year Budget Establishment Multi-year Procurement Funding Level of DoD Funding	--------	Stable Work Force
	National Skills Inventory National Skills Training Program	--------	Trained Work Force
	5 Year Budget Establishment Multi-year Procurement Funding Level of DoD Funding	Fund Time/Money	Producibility
LOGISTICS		Streamlining Initiative	Improve Systems and Procedures
	5 Year Budget Establishment Multi-year Procurement Funding Level of DoD Funding	Fund Time/Money	Producibility
	Reduce Inquiry	Recognize need for overhead support	Provide more support to Operator
	5 Year Budget Establishment Multi-year Procurement Funding Level of DoD Funding	Longer Lead Times Program Stability Willoughby Templates (Design to Production)	Improve Front End Strategic Planning Risk Assessment
TECHNICAL	5 Year Budget Establishment Multi-year Procurement Funding Level of DoD Funding	Man Tech	Invest in new process Material and CIM development
	Reduce Inquiry	Streamlining Initiative	Reduce overlapping, redundant "how to" requirements
	5 Year Budget Establishment Multi-year Procurement Funding Level of DoD Funding	Fund Time/Money	Producibility
MISC.	Abolish weather and/or other Acts of God	--------	Transfer savings unto customer

EXHIBIT 7

INDUSTRIAL ENGINEERING TERMINOLOGY DEFINITIONS (ANSI Standard 294.0-1982)

WORK MEASUREMENT - A generic term used to refer to the setting of a time standard by a recognized industrial engineering technique, such as time standard, standard date, work sampling, or predetermined motion time systems.

NORMAL TIME - The time required by a qualified worker to perform a task at a normal pace to complete an element, cycle, or operation using a prescribed method.

STANDARD TIME - A unit time value for the accomplishment of a work task as determined by the proper application of appropriate work measurement techniques by qualified personnel. Generally established by applying appropriate allowances to normal time.

ALLOWANCE - A time value or percentage of time by which the normal time is increased, or the amount of non-productive time applied, to compensate for justifiable causes or policy requirements which necessitate performance time not directly measured for each element or task. Usually includes: irregular elements, incentive opportunity on machine controlled time, minor unavoidable delays, rest time to overcome fatigue, and times for personal needs.

LEARNING CURVE - A plot of productive output or unit work times of individual or group as a function of time or output per unit time; used to predict the learning rate in starting a new job or project. A learning curve is usually exponential and flattens out with time.

TRAINING/LEARNERS ALLOWANCE - An allowance to compensate for an untrained worker's learning effect.

STARTUP CURVE - A learning curve applied to a job or process to adjust for work times longer than standard, or average, as a result of the introduction of a new job or new worker(s).

CYCLE - The complete sequence of activities, operations and machine or process times required to complete one segment, unit, or batch of work.

TRAINING - The totality of instructions, planned circumstances, and directed activity by which personnel acquire and/or strengthen new concepts, knowledge, skills, strength habits, or attitudes which will enable them to perform assigned duties with maximum reliability, efficiency, uniformity, safety, and economy.

TRANSFER OR LEARNING - The phenomena through which information acquired in one situation is applied or "transferred" to some other situation, most usually an operational one.

EXHIBIT 8

INDUSTRIAL ENGINEERING HANDBOOK - Third Edition, H. B. Maynard

QUALIFIED OPERATOR - A person who has the mental and physical characteristics, the job knowledge, and the experience required by the work being performed and who should be able to meet or exceed the performance level on that work without undue mental or physical fatigue.

METHODS TIME MEASUREMENT (MTM) - A system of predetermined motion time standard. It is a procedure which analyzes any operation into certain classifications of human motions required to perform it and assigns to each motion controlled only by the individual performing it a predetermined time standard determined by the nature of the motion and conditions under which it is made.

Section 5 Chapters 1 through 4 - Discuss the Predetermined time systems.

Section 7 Chapter 5 LEARNING CURVES - Walton M. Hancock, Professor I.E. University of Michigan.

TWO SEGMENTS:

1. THRESHOLD LEARNING - Where the person is learning the sequence of events that they have to do, and the
2. REINFORCEMENT LEARNING - Where the individual knows the sequence and by repetition improves their ability to perform the task.

Elements of a Learning Curve:

1. the time for a given cycle at a certain cycle number;
2. the cumulative time taken for all cycles up to a given number; and
3. the average cycle time for a given number of cycles at any given number of cycles.

The effects of breaks, in production, on operator learning.

A learning curve is, in effect, a rate-of-improvement curve.

The learning curve is so widespread that its absence is almost a warning of mismanagement or misunderstanding.

Main Factors effecting the slope:

1. The inherent susceptibility of a process to improvement.
2. The degree to which that susceptibility is exploited.

EXHIBIT 9
REALIZATION FACTOR BIBLIOGRAPHY

BIBLIOGRAPHY

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Senator Grassley. Mr. Castle?

Mr. Castle. Good afternoon. My name is Donald Castle.

Work measurement is a vital and necessary tool in the field of good management. Since the days of Frederick Taylor, work measurement has been a necessary part of scientific management. The fundamental principles of Taylor are as true today as they were 73 years ago, when Mr. Taylor testified before the Special Committee of the House of Representatives To Investigate the Taylor and Other Systems of Shop Management, under Authority of House Resolution 90.

The most prominent feature of what he called scientific management was the "idea of setting a measured standard of work for each man to do each day." If ever any industry needed good management, it certainly is the defense industry.

This committee has, I am sure, seen some rather frivolous statements from members of the Department of Defense regarding work measurement and scientific management—statements that indicate that they believe that there are prepackaged standards for almost any product that can be pulled off a shelf in the local industrial engineering store; statements that indicate that they believe that close tolerance work exists only in goods manufactured for the military; statements that indicate that they believe that robots have made engineered standards less reliable, and finally, that they believe that the 10 percent labor content of a prime contract represents the total labor in a product.

Obviously, I am sure you have seen through that.

We, as one of the most experienced consulting firms in the area of productivity improvement, firmly believe that work measurement is just as necessary in the defense industry as in the automotive industry, the garment industry, the consumer appliance industry or the electronics industry. How can it be less important to know what your labor should cost in the defense industry than in any other industry?

The only reason would be that the Government needs the product regardless of cost and is willing to pay whatever it does cost. This is obviously not the course that we can afford to follow.

I have heard reports of claims that work measurement will adversely affect quality. I have heard that work measurement will be detrimental to the improvement of methods. I have heard that work measurement destroys teamwork. From my 27 years of experience, I know the opposite to be true.

Quality will be enhanced by the operators paying attention to the work in front of them, rather than watching or listening to their neighbors. We have installed as many or more incentive systems in plants around the world as anyone. To the best of my knowledge, quality was equal to or better than what was in place prior to the installation. In no case of which I have knowledge has quality been adversely affected through the use of properly engineered and installed standards.

The work measurement system most frequently used by our firm, Maynard Operation Sequence Technique, or MOST, very specifically emphasizes the method sensitivity aspect. I have personally trained many persons in this technique and have shown them how to quickly scan an analysis for the purpose of spotting methods improvement opportunities. Every work measurement proposal we prepare makes reference to the increased methods improvement potential available to the prospective client.

Teamwork has been made to work as an advantage in every line-paced operation of which I have knowledge. I know of no line-paced operations in civilian industry that do not have standards. Management must know the necessary labor content in order to set the line speed and properly allocate people to the line.

Are engineered labor standards and scientific management principles still effective? Just ask our clients. We advertise that there is a productivity improvement potential of 20 to 40 percent in the typical unmeasured commercial industry plant. We, in close cooperation with our clients, have been able to achieve those numbers repeatedly.

Advances in the technology of work measurement have made the measurement of work practical that was once thought to be either impossible or impractical. We can now measure the labor required to build a ship and have been doing just that for several years at a variety of shipyards. We can measure the labor required to build a rocket and are currently doing that. We have been measuring maintenance work for the last 30 years.

Is there a place for work measurement in the defense industry? We believe that the answer is a resounding yes.

Thank you, Mr. Chairman.

Senator **Grassley**. Thank you very much.

[Statement follows:]

PREPARED STATEMENT OF DONALD CASTLE

Work measurement is a vital and necessary tool in the field of good management. Since the days of Frederick W. Taylor, work measurement has been a necessary part of "Scientific Management." The fundamental principles of Taylor are as true today as they were 73 years ago when Mr. Taylor testified before the Special Committee of the House of Representatives to Investigate the Taylor and Other Systems of Shop Management under Authority of House Resolution 90. The most prominent feature of what he called "Scientific Management," was the "idea of setting a measured standard of work for each man to do each day."[1] If ever any industry needed good management, it certainly is the defense industry.

This Committee has, I am sure, seen some rather frivolous statements from members of the Department of Defense regarding work measurement and "Scientific Management." Statements that indicate that they believe that there are prepackaged standards for almost any product that can be pulled off a shelf in the local industrial engineering store: statements that indicate that they believe that close tolerance work exists only in goods manufactured for the military: statements that indicate they they believe that robots have made engineered standards less reliable: and finally that they believe that the 10% labor content of a prime contract represents the total labor in a product. Obviously, you have been smart enough to see through this smoke screen.

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Is there a place for work measurement in the defense industry? We believe that the answer is a resounding, YES!!

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1. Fredrick W. Taylor, "Taylor's Testimony Before the Special House Committee" in "Scientific Management," (New York, Harper & Brothers Publishers, 1947), page 6

Senator **Grassley**. Let me compliment both of you on summarizing your statements. We appreciate that very much. It does not happen very often, which is why I am a little bit shocked that you were both done so quickly.

Mr. **Castle**. We try to do things efficiently.

Senator **Grassley**. Just because I address a question to one individual does not mean the other individual cannot respond. There are some questions I would like both on you to respond to, but there is no effort here to limit anything.

The first question to both of you is: From your judgment, how much room is there for improvement in the defense industry, from the standpoint of efficiency?

Mr. **Engwall**. In our opinion, that is a very difficult question to answer. One has to look at the product complexity, at the basic point on the learning curve you are at in terms of production and rate volume, versus the actual standard that we set, which is basically based on achieving standard, which is some point where the average operator, with average work pace, et cetera, does that.

One has to go up that learning curve or improvement curve, as we call it, and measure the deviation from that learning curve at that specific point in time.

Senator **Grassley**. Mr. Castle?

Mr. **Castle**. My answer would be very similar to that, in that I do not think there is any one generalized answer that can be given that is going to be applicable to the entire defense community.

There are some defense plants, I am sure, where a 20 to 40 percent productivity improvement is well within the realm of possibility. I am sure there are others where, for all practical purposes, there will be none. It is going to be very much dependent on that particular operation.

Senator **Grassley**. Would you give me some specific examples?

Mr. **Castle**. One of our clients, to whom I make reference, is in the business of manufacturing fuses for ammunition. I know of them having very, very good efficiency, where they have a realization factor, as far as I know, of something less than one, which is almost unheard of in the defense industry. It is not very common in the civilian industry. They are able to do it because they have an incentive system and are operating it well.

There are other instances where we have gone through plants and seen operations which are—as an accounting professor I once had in school said, it is like scratching your ear this way, doing things the hard way. [Indicating.]

Senator **Grassley**. To both of you, in your professional opinion, do you think that tightened standards and work measurement systems prevalent in commercial manufacturing are applicable to the defense industry manufacturing, and something which should be used more widely?

Mr. **Engwall**. We believe in the aerospace industry that we have been continually working to further our enhancement of using work measurement systems. We have had work measurement systems in our industry for a substantial period to time.

We feel that the type of data that one uses to set standard time is no different in the defense industry than in commercial industry. It is basically based on certain product requirements, with certain methods and processes and operator learning. Generally speaking, the difference that occurs in the defense industry, compared to commercial is that in many instances, our manufacturing operation cycle times are substantially greater than in commercial industry. Therefore it takes one longer in elapsed time to repeat the operation sufficiently in order to gain the job familiarity necessary to achieve the performance level standard.

Our standard time should be the same for the same operation in both the commercial and defense industry. In my experience, I have used the same standards methodology in both industries. In fact, I am familiar with the plant that Mr. Castle is referring to, because I hired H.B. Maynard as a consultant to help us improve performance in that plant. Fuse manufacturing is very high-volume production, with very high rate methods and tools employed and the same standard data that is being used elsewhere, in companies like I am familiar with now. The standard time is set the same way, but the point on the learning curve that one achieves standard is different, and therefore our actual costs are different.

Senator SPECTER. May I interrupt for a moment and ask you why the point on the learning curve is different?

Mr. ENGWALL. Because, sir, we are measuring against a commonly accepted definition of standard time. Standard time is predicated on basically what we call three factors. It is an average operator working at an average work pace with the best method. It is established to the extent that I could not sit down on unit 1 and be able to achieve the standard time with that method.

We could set standards for unit 1, using the techniques that we have, and achieve an efficiency in your realm of 100 percent, and the cost would be exactly the same. In fact, in our opinion, it would be worse, because we would not have a goal to strive for, to achieve the standard time which is established for the average operator, working at an average work pace, and best utilizing the method. We would need to establish a different standard for each subsequent unit to be produced.

Senator SPECTER. Thank you.

Mr. CASTLE. If I may amplify just a little bit on what Mr. Engwall has said, I think if you draw a straight line across on a graph, and picture that as the line being your standard and the slope of the learning curve, and the difference between the standard line and the learning curve line would be that factor which is added to the standard to bring it up to the learning curve, and that incremental difference progresses as it moves down the curve. But the relationship of standard still stays the same. The standard is a fixed number on unit 1, unit 100, or unit 1 million.

Senator SPECTER. Thank you.

Senator GRASSLEY. Did you want to respond to my general question, in which I asked about the work measurements prevalent in the commercial industry being applicable to the defense industry?

Mr. CASTLE. We use the same work measurement system in both. We have done work in both, and the same work measurement systems are used in both civilian and military.

Senator GRASSLEY. And you think they should be used more widely in the defense industry?

Mr. CASTLE. Yes, I do.

Senator GRASSLEY. As Mr. Engwall has said, the actual to standard variances may be caused by production volume, program stability, and complexity. Mr. Castle, from your standpoint, are these valid factors for measuring whether or not standards are met?

Mr. CASTLE. Those are valid factors which influence the ability of the contractor to meet standard. Certainly, the frequency of change has a real impact on the ability of a contractor to do that. I know of one instance where a representative of one of the defense contractors told me he had an average of 60 changes a day on the product he was making. I think anybody in their right mind would recognize that trying to keep up with that volume of changes is rather difficult.

Senator GRASSLEY. To what extent is that good management?

Mr. CASTLE. That is not the fault of management. That is the fault of management and the buyer.

Senator GRASSLEY The fault of the buyer?

Mr. CASTLE. The buyer is making those changes, not the contractor.

Mr. ENGWALL. May I comment on that, Mr. Chairman?

Senator GRASSLEY. Yes.

Mr. ENGWALL. If one goes back from the contractor to the buyer, as Mr. Castle indicates, that would be true, except there is one area that is different. In our opinion, to a great extent—and of course, there are commercial instances where it is the same—the mission and the product requirements for the functionality of the design are much more, complex in the defense industry, because of what we are trying to do with and end product. Shooting things off in space, where the environmental criteria, the density, the light weight, and the increased strength criteria, require more demanding tolerances, The manufacturing processes that we use—which are no different between defense and commercial, in many cases—are not capable of meeting those requirements. That is why we have so much rework and repair on the front end of systems until we are able to do those tradeoffs of functionality versus process capability. Clearly, the business that we are in has the most impact on products cost and/or achieving standard time, not the management on either side, contractor or buyer.

Senator GRASSLEY. To what extent is the seller to blame for the variance—like, for example, scrap/rework—quality?

Mr. CASTLE. To what extent is who responsibile?

Senator GRASSLEY. The seller. The contractor. You said you brought the buyer into the situation.

Mr. CASTLE. Yes. Certainly, the defense industry contractors are much the same as civilian industry contractors in that nobody has yet devised the perfect system and the ability to produce parts perfectly every time.

I think to make generalizations about the amount of scrap is doing an injustice to everybody. Certainly, there are cases where the amount of scrap is well within reason, and there are those cases where it is absurd.

I think if you looked at a comparable tolerance part in a commercial industry, you would probably find somewhat similar rates of scrap and rework.

Rework, by the way, may be generated or seem more prevalent with a high-value product than might be true with a low-value product where, if the product value is such that it is not worth the effort to rework it, the part may just be thrown away where, in the case of a high-value part, it is worthwhile putting in the rework to it, and you could therefore have a higher level of rework become apparent.

Senator **Grassley**. Mr. Castle, I would like to have you, if you can, clear up some terminology confusion on this subject. I have said repeatedly that on average defense contractors are operating at 33 percent of normal efficiency, based upon a comparison of actual labor hours to standard labor hours, or as I would say, "should take" times, on data received from major contractors working on numerous weapons systems. That is what we have had before us a basis for some of the legislation, as a basis for some of the discussion we have had.

I would like to have you, and, for that matter, Mr. Engwall, if you can shed some light on discussing whether it is overall efficiency or net workers productivity which I would be referring to.

Mr. **Castle**. I think your 33-percent efficiency number perhaps would be better stated as about a 3 realization factor, or realization factor of 3. Efficiency, if we were to use the terminology and definition provided in MIL-STD 1567-A, refers to a specific operation; the amount of earned hours—earned hours—and the number of actual hours that are used to actually produce that part by that operator on that operation. And if you divide one by the other, you will get efficiency.

Realization factor includes more than that. It includes all of these other peripheral things that are required but do not show up. The third term that you mentioned is net productivity. And if I may perhaps use the board——

Senator **Grassley**. Yes, please.

Mr. **Castle**. The way we commonly arrive at the net productivity number is to arrive first at a utilization number, multiply that times an efficiency number, multiply that by a method level number, and arrive at net effectiveness, or net productivity. Utilization refers to what percent of the available hours the employee is actually engaged in doing productive work. He is never going to hit 100 percent. It is totally unrealistic to think he will—breaks, just going to the bathroom, going to get a drink of water—anything like that is going to lower utilization. And just for the purposes of argument, let's call his utilization 50 percent—an easy number to multiply by.

Worker efficiency—how fast is he working during the time that he is actually working? Let's assume that he may be working at 80- or 85-percent efficiency. Eighty percent is not an unusual number. Method level refers to that degree of sophistication in the method, or optimization of the methods, that is possible. If you wanted to, you could use an example of an instance that I saw, where one man was grinding and another man was holding a vacuum hose to collect his dust, where there was no reason why there could not have been a permanent attachment on the grinding gun to hold that. So, method level enters into it, and method level in this case may be—just for the sake of argument, let's say that is going to be

100 percent. That will simplify our arithmetic. Fifty times 80—you've got a 40-percent productivity. If you do something to increase this now, and you raise utilization from 50 to 60 percent, and you raise efficiency from 80 to 85 percent, leave method level alone, and you are now up—if my arithmetic is right—about to 51-percent productivity. And if you divide 11 by 40, you have increased the productivity by a little better than 25 percent.

Senator **Grassley**. What kind of realization factors are found on the average in commercial industry?

Mr. **Castle**. We have seen utilization factors—that term is not used in commercial industry—but as close as you could.

Senator **Grassley**. Just, say, on the average.

Mr. **Castle**. Numbers ranging anywhere from less than 1 to probably 10, 12, somewhere in that vicinity, would be the worst I could think of.

Senator **Grassley**. Go ahead, Mr. Engwall.

Mr. **Engwall**. Mr. Chairman, in my experience, and those of us that are in companies that have commercial operations as well as defense, commercial industry uses the same improvement curve methodology as we do in the aerospace industry to estimate manufacturing startup expenses that are incurred prior to achieving standard cost. They do not use the terms "realization factor" or "improvement curve" because they set standards with the intent that standards are achievable which is production. They achieve standard so quickly in elapsed time because of the significantly higher rate and volume of the product than in our industry. What they do—and I spent a great deal of my time in this industry—is to basically allocate the startup expense in their accounting as if it were research and development, capital equipment, or new product sales and marketing introduction expense—and amortize that over the life of the product and call that an "up-front, nonrecurring cost expense", before they are working at standard.

We would be working at standard time too, because we would then be in our language, close to that point where we have achieved the rapidly of operation necessary to achieve standard time.

If you would like to buy more products at faster rates, we would be glad to achieve standard time and give you 100 percent efficiency, sir.

Senator **Grassley**. Let me read something from a recent news article, quoting an official from Boeing. I quote:

> For their part, Boeing officials do not accept the idea that there is any meaningful conclusion to be drawn from the difference between estimated and actual hours, even if it were available. Rather than be an estimate, the figure provided—i.e., "should take" time—was a prediction of how well the job could be done if conditions were perfect.

There seems to be some confusion within DOD and among defense contractors as to whether labor standards are considered a floor or a ceiling for worker performance. In the same light, similar confusion reigns over whether the standard represents perfect performance under optimum conditions, or perfectly normal performance under existing or ordinary conditions. I would like to have you both elaborate on that, if you can.

Mr. **Engwall**. Standard time is basically the time it takes for a fully trained operator working with prescribed methods and conditions. It should not be any different in the commercial industry than in the defense industry.

The difference exists because the rates of production and the volume change according to the complexity of the product. At the point at which we are usually being measured, we have not achieved that volume criteria of setting standard.

We are striving to systematically measure performance against standard, because we are always proposing contracts requiring submittal of cost and pricing data before we have achieved standard time. We use the improvement curve to predict where we should be at a given point in time, and that is really, in our opinion, the "should take" time. It is a standard time run up a properly defined improvement curve based on those conditions, which are different for every contractor, for every process, for every product. It is a component of the functionality requirements as well as the manufacturing processes employed. Then it will be the same, generally speaking between contractors.

Senator **Grassley**. Mr. Castle.

Mr. **Castle**. I cannot differ with that.

Senator **Grassley**. OK. As a member of the Senate Budget Committee, I have received information from the Air Force which reveals that some defense contractors, on very specific projects, are operating within labor efficiency ratings between 30 and 40 percent. Mr. Engwall has referred to this in his testimony and argued that this is not so bad when you consider factors such as learning curves and complexities of the weapons systems.

I would like both of you to respond to three basic questions in regard to this.

First, are there any compelling reasons you could offer as to why DOD should accept such efficiency levels?

Second, how would such a rating hold up in a competitive commercial environment?

Third, do these numbers reflect an overall productivity problem in the defense industry?

Mr. **Engwall**. First as regards, Mr. Chairman, did you ask compelling reasons why DOD should accept this inefficiency?

Senator **Grassley**. Yes—are there any?

Mr. **Engwall**. Yes, there are. From DOD's point of view, they are buying, the complex products at varying production rates and volumes. For what they have defined, at the point when they are making that decision, they will get a different cost and price than if they were buying a mature program.

The seventh buy on a program will be substantially down the learning curve and toward the standard than, as an example, the first buy. So they have to look, from the Department of Defense point of view, to the maturity of the program and also the complexity of the program.

With regard to the competitive nature of the commercial industry, contractors compete with each other in the aerospace industry, just like commercial does from a market point of view, and frankly, it contractors were not employing the most efficient methods and procedures for doing things, we would not be getting contracts. Basically, we have to be competitive to survive.

Third, it is our feeling that the aerospace industry has in many cases been leading this country in identifying what the key issues are relative to improving productivity. In fact, we, in AIA, have been involved since 1979 at the national level. In fact, at the White House Conference on Productivity, we went on record identifying those factors that would make us more productive, and we found there were many things more significant than work measurement. Most of them relate to the actual mission requirements themselves, to the time that the DOD is sometimes forced into because of the country's needs, and the fact that we are rushing into production much sooner than we might in commercial industry. In commercial industry, we would not put a product into production until we had achieved the cost objectives that we need and met required quality objectives needed to satisfying the customer.

Producibility, therefore, is one of the key factors that drives our ability to achieve that.

Senator **Grassley**. In regard to the third point, then, I suppose your conclusion is that these numbers do not reflect an overall productivity problem in the defense industry?

Mr. **Engwall**. That is correct, with regard to what DOD is buying against a point in time. We are as concerned as you are with the taxpayers' money, and want to reduce that cost.

Senator **Grassley**. OK. Mr. Castle, on those three points.

Mr. **Castle**. I think there are some reasons for the Defense Department to accept those numbers in some instances, and there are other instances where they should not.

I cannot sit here and specifically pinpoint where they should and should not. I do not have that kind of information. But from a general standpoint, I am sure there is room for improvement in the defense industry, just as well as there is in others.

The competitive environment——

Senator **Grassley**. Does that mean we need more analysis for you to make a judgment like that?

Mr. **Castle**. I am just saying that I personally do not have that, or access to that.

The competitive environment of commercial industry—I sort of smiled when Mr. Engwall said the commercial manufacturer does not put the product into production until it is ready. I have seen too many cases where that is not true, Dick.

I think the commercial industry is every bit as guilty, and perhaps even more so, than the defense industry in that regard, in that the sales department will go out and sell the item before it is totally off the drawing board, and all of a sudden, the manufacturer is put into a position of having to produce it immediately, right away.

Agreed?

Mr. **Engwall**. For the record, I agree with you. The context I meant is that those decisions are totally within a commercial contractor's top management decision.

Mr. **Castle**. That is true.

Mr. **Engwall**. In the case of the defense industry, the buyer and the manufacturer are two different people. DOD establishes requirements from the buyer point of view, and the contractor has little to do regarding that.

Mr. **Castle**. A typical example of that was what happened to Osborne Computer, where they announced the advent of a new computer prior to its being ready for manufacture, and their sales of the current computers dropped off, just stopped, and as a result, they went bankrupt.

Is there an overall productivity problem in the defense industry? From what I have seen, there are opportunities in the defense industry. I cannot say that there is an overall pervading problem. I think that is trying to paint too broad a picture, and condemn, in general, where there are certainly cases where that in not the case.

Senator **Grassley**. I guess I have to ask you, why can't you say that?

Mr. **Castle**. Because I know of instances where it is not true.

Mr. **Engwall**. Mr. Chairman.

Senator **Grassley**. Yes.

Mr. **Engwall**. I would like to draw your attention to the realization factor improvement curve action plan that we have on page 33 of our written statement. This action plan defines what we feel industry needs to do. You will note that we agree 100 percent regarding standard labor, that we need to implement cost-effective work measurement programs. From the Department of Defense standpoint, they need to apply MIL-STD 1567-A policy requirements, but should not tell us how to do it. They need to tell us what the requirements are and what criteria we have to meet, but not define the details below that.

If you take a look at the tough labor elements defined therein including the learning factor, the logistics factor, and the technical factor which, in the technical writeup, are defined, we say that one of the most critical actions needed to reduce cost producibility. Part of the producibility problem is funding, both time and money. This, in many cases, goes back to the nature of our business. In fact, to us, the Congress and the executive branch of our Government are not unlike the Department of Defense. You are limited in terms of not being able to establish a budget for any length of time and therefore establishing multiyear program funding for as long as possible. The level of program stability varies in terms of that funding which, in the commercial industry, those strategic planning decisions are made upfront before the product is designed. In the commercial industry, we know what the strategic plan is. In the case of our defense business, we do not; however, that is something that we need to mutually accomplish if we want to reduce costs.

Mr. **Castle**. If I may add one further statement to that question on competitive environment of commercial industry, one of the things that we preach time and time again to our commercial customers—the same would be true to defense contractors equally well—is that standards and labor reporting are required in order to be able to well-define the cause of delay, to be able to measure and identify those causes of delay. Unless you can identify them, you cannot do an awful lot to fix them.

Senator **Grassley**. Does work measurement measure process, or does it measure product?

Mr. **Castle**. Work measurement does not measure process or product. Work measurement measures labor.

Mr. **Engwall**. Labor measurement measures the operator or the person.

Senator **Grassley**. I think you had better go into some more detail for me on that.

Mr. **Castle**. All right. If I can use in an example of an operator operating a numerical-controlled lathe, or machine—let's keep it in generic terms—the operator reaches to a totebox or a pan, picks up a part, loads it into the chuck or into the jaws of what is holding the part for machining, and turns on the machine. When the machines finishes, he unloads the part, perhaps deburrs it, and asides it. The time during which the machine ran is considered process time or machine time. The operator time for him to pickup the part, load it in the machine, tighten the jaws, whatever, and for him to lossen it and take it out and aside it, is manual time, labor time. The two are rolled together in a standard for that operation. You will have a combined unit of time. It may be expressed in hours per hundred, pieces per hour; there are lots of different ways of doing it. But regardless of how you state it, it is still the measurement of the man's time to do that, coupled with the machine time, in this case.

There are other operations where it is strictly a manual operation—not process time or machine time. That is strictly all manual man-time. And then there are others where one may be operating several machines, and his time is then divided among the many machines he is running.

Senator **Grassley**. Mr. Engwall, go ahead.

Mr. **Engwall**. Mr. Castle, you made reference to net effectiveness, which we agree on. That is really a common factor we all use in industrial engineering. The term you used, "methods level," really is what we would call the process efficiency or methods efficiency. In other words, if I had a process that I was doing manually, and it took me *x* amount of time, and even if I actually was able to achieve that and was meeting standard, I could reduce that standard if I cold do it by machine for 50 percent less. That basically would be the methods efficiency, because the actual operation standard itself would be reduced.

Now, we have a strong interest in the defense industry to invest in automation or "factory of the future" facilities. In fact, the Industrial Modernization Incentive Program is geared toward a total return on investment to make it attractive for companies to invest because of the length of program stability that we otherwise do not have. For the most part that will implement manufacturing processes that require substantially lower standard and estimated actual time. In fact, some of our automated facilities are getting to the point where we have no "man-time." We now have cost accounting problems in the sense that we are using manufacturing process time as the means of measuring standard. This is really the direction we need to go to as a country.

Senator **Grassley**. Can work measurement systems be designated to take into account all of the unique manufacturing conditions in the defense industry, such as low-quantity production runs, technical sophistication, and constant engineering changes? I suppose there are a lot of others that we ought to list there, but let us just stop with those three.

Mr. **Engwall**. The reason we keep referring to operating at 33 percent of standard time is because of exactly those manufacturing conditions that are again driven by, as you define them, those factors that make up the actual time. We call this actual time the organizational or net effectiveness efficiency, as opposed to standard, that is based on average conditions, perfect situations.

Mr. **Castle**. You have that work measurement system. It does not differ from what is currently available. Work measurement system is no different—and we have said this previously—both of us—that the work measurement that is used for measuring the assembly of a Buick automobile or the assembly of your Zenith television set or the assembly of a solid rocket booster for the space shuttle may still be the same work measurement system. You have a different of set circumstances in its application and in the envioronment in which it is used, but the basic work measurement system is identical.

I think one of the things, perhaps, that you are getting at is, Can a work measurement system exist that is able to recognize variations from piece to piece, or whatever? And the answer to that is yes. We have been putting in work measurement systems for maintenance operations, as I said in my prepared statement, for 30 years, and I think we all recognize that in order to measure maintenance work, you can do it, and you can do it with reasonable accuracy. But you do not try to do it to the 10th of a second, and you work with balancing time, generally, of 40 hours, not the half-hour prescribed by MIL-STD 1567-A.

Senator **Grassley**. Go ahead, Mr. Engwall.

Mr. **Engwall**. I would like to confirm what Mr. Castle stated, and add one other criterion; the work measurement system for the defense industry should be the improvement curve. We should have work measurement systems to set standards in the same way the commercial industry has done for standard time. And we should have a system for identifying and controlling those goals we set as improvement curves to actually come toward approaching standard time when the conditions are met.

Currently, General Scantze, Commander of Air Force Systems Command, has been really putting emphasis on this in order to get contractors to do a more detailed analyses of what that realization factor and improvement curve performance should be. In fact, we make reference in our written testimony to the meeting that was held at Kirkland Air Force Base on February 20, 1985, when Air Force Systems Command stated industry criteria and what we are doing to try and address those issues.

Senator **Grassley**. I think you have the memo I handed out in which DOD commented on the Grassley amendment.

I would like to ask you to respond to some of the points they made. I will read from roman numeral II. They say, "Provisions of the standard hour amendment are premature, excess, costly." Then they say, "One, the amendment"—and they would be referring to work measurement—would adversely—I think that is implicit though it is not there—"would impact quality."

Do you believe that?

Mr. **Engwall**. I believe that is the context that it is made. I do not believe that in a pure sense. We ought to, from a work measurement standpoint, be able to review the steps an operator is required to do to fully look at something for this type of quality criteria, and establish a standard time. Traditionally that is not done in many industries, because there are not adequate predetermined time value for this type of authority. It is more complex to define how I look at something because if I have five types of criteria versus two types of criteria, I would set a different standard. So traditionally, we treat that as a part of the learning curve as opposed to a part of the standard.

I believe the concern is if that time is made part of standard, and we are beating operators and contractors over the head to standard, as some people at this hearing are attempting to do, then there is concern that we are going to be so interested in quantity to hit that standard that we are going to ignore the quality issue which DOD is most concerned about, and frankly, so are we.

Mr. **Castle**. I think my answer to that was covered in my opening statement, where I said that in no case of which I have knowledge has quality been adversely affected through the use of properly engineered and installed standards. I am sorry, but I just do not buy that statement.

Senator **Grassley**. Then, let me ask it another way. Can quality be enhanced by work measurement?

Mr. **Engwall**. Quality can be enhanced in the sense that to us, when we look at quality, we look at the critieria that we are setting standards for. Quality criteria usually make us look at process capability and productibility. Much of the rework and repair kinds of expenses, and that particularly associated with early production are because of the complexity of our designs versus productibility, where the manufacturing process capability is not as tight as the design requirements are. However, there should be no reason why that would impact quality if we look at that criteria properly through productibility analysis, et cetera. In fact it should enhance quality.

Mr. **Castle**. I think one of the virtues of work measurement is that in the act of doing the work measurement, you will sumbit the operation to a much closer degree of scrutiny than has been previously afforded it, and, in the process of that, are very likely to enhance the quality of the product.

Senator **Grassley**. Another comment under roman numeral II states: "work measurement advocates the management philosophy—scientific management—that has been made obsolete by the forces of international competition."

Would you comment on that?

Dr. **Engwall**. "Operator efficiency"—as many of the criteria are defined in the amendment—is only one factor in evaluating organizational effectiveness. Operator efficiency measures performance against standard time. In all of the other criteria, we are looking at managing the process and the method and the interaction of the person with the process. Those people who are advocating work measurement and calling us inefficient, are only looking at operator efficiency. That is, frankly, not at all conducive to what is really going on in the world.

Certainly, Japan and other countries—and we have been doing a lot of analysis of this in the aerospace industry—are looking more at the process and quality and process capability than they are at the man-time. In fact, in Japan, they do not use standards to the same extent that they are used here. They are more concerned with the quality of the process and the method and the investment. They make much more significant long-term investments which again gets back to the stability of the budget and the program as it impacts on those decisions on automation and process, as opposed to operator.

Senator **GRASSLEY**. You are not saying anything of that nature is obsolete; you are saying we are not being inclusive enough.

Dr. **ENGWALL**. You are not being inclusive enough, and that is the least priority. If I were in the position of wanting to most effectively influence productivity, I would be concentrating on producibility, on streamlining initiatives to reduce the administrative regulations and specifications that tier down, and on trying to incentivize our industry in order to invest in automation like the other leading countries are doing one of the most significant actions now being undertaken by the Defense Department is implementing the Industrial Modernization Incentives Program, or IMIP. The same thing is true with the streamlining initiative and what needs to be done on producibility, sir.

Senator **GRASSLEY**. Would you comment, Mr. Castle?

Mr. **CASTLE**. As far as we are concerned, scientific management has not been made obsolete. I think a proper perspective in which to place this is to realize that standards by themselves are not an end all in the process. Standards are only a tool through which you achieve other things. They bring other things to light. They help you identify problem areas and enable you to cure them. And I would differ from what Mr. Engwall says in one respect. Perhaps in Japan, they are not currently using standards to a degree equal to what we are, but we have seen a renewed interest from other consulting firms in Japan coming to us and now asking if they can license our work measurement system for use in Japan.

Senator **GRASSLEY**. I would suggest—and we often refer to Japan—but they do not seem to have the adversarial competition between management and labor that we have in this country. It seems to me that's noteworthy when you are talking about their emphasis upon quality versus quantity.

Perhaps we are going to learn from that process; maybe we are slowly learning from them in that regard already.

I now would like to refer to No. 9:

> Emphasis upon production quantity is at variance with current efforts to improve quality. The application of time standards to improve efficiency leads to employee demotivation and an overemphasis on moving products out the door to sacrifice quality.

To some extent, Dr. Engwall, you already have spoken to this, but I would like to have you speak specifically to this point, even though it might be repetitious.

Dr. **ENGWALL**. I understand, sir. That again goes back to the point that there have been many critics of the Department of Defense, as well as us as an industry, relative to the efficiency we have attained. In fact, in your testimony, you stated that we are 67 percent wasted.

Our people in the aerospace industry, like any industry, do not feel that we as persons, workers, where standard time and work measurement are applied, are only one-third efficient. In that sense, it has a demotivating and demoralizing effect.

If one looked at what we call proper work measurement in our defense industry, which is not just looking at standard time, which we fully support, but running it up an improvement curve to determine what the estimated actual time ought to be at each point in time—it is different for every process. There are methodologies that can be used intelligently for doing this. In fact in many of our factories we are measuring actual deviation from the estimated improvement curve that has been preplanned. In other words, this is where one ought to be at this point in time, and if one deviates unfavorably at that point in time, one is considered to be inefficient, as if being measured against standard.

Now we have a managment pool that we can effectively use, and see improvement in our process as people are measured intelligently. There is nothing worse than to have a standard set for you that you know in your own way, there is no way of achieving on unit 1. That is demoralizing and also makes me want to be more concerned about quantity than quality, which we cannot afford to do in our industry. That only adds cost in terms of rework and repair, it does not reduce cost.

Mr. **Castle**. A number of years ago, Mr. Grassley, I used to live in your home State. I worked for Collins Radio in Cedar Rapids. They had a technique to try to improve that relationship, and still use the learning curve and standards productively. Each operator kept a chart posted right in front of him at his workbench. Each day, each operator was advised of what is efficiency had been the day before, and they posted it themselves on that chart, and watched their progress on the learning curve. As long as they stayed at or below that line, they got no grief from anyone. If they deviated above, someone was going to ask them why, what was the problem.

There was an instance where standards were used productively, they were used with a learning curve in a defense industry—we were producing military radios—and it worked and worked well.

There was no demoralizing effect.

Senator **Grassley**. I would like to bring up the last one, No. 12: "The standards result in a de facto ceiling placed on performance, rather than an emphasis upon constant improvement."

Do you feel that way?

Mr. **Engwall**. No, I do not. A standard is based on a particular method and equipment that one is defining, as Mr. Castle indicated in his method level efficiency rating.

It is our objective to be constantly cost effectively improving the method and the process which will establish a new standard time. I think the concern is that some people are making accusations against both the Department of Defense and our defense industry that we are inefficient against standard, and it basically gets misquoted. There is a concern within DOD that we were trying so hard to hit 100 percent of standard and did not spend time on doing methods improvement as well as making major investment we would not be as cost effective. Methods improvement and improved workplace layout and different tools can reduce cost with little investment. And there are other actions involving a substantial degree of automation and resultant capital investment, which would have a step function on reducing cost. In fact, on many of the Industrial Modernization Incentives Programs implemented there have been significant changes in methods and standards associated with capital investment.

Mr. **Castle**. I think rather than to say that the standards result in a de facto ceiling, I cannot agree with that, but I think if you were to rephrase that and perhaps say that the learning curve is to some extent self-fulfilling, or a prophecy that is self-fulfilling, and call that a ceiling, and say that yes, you can fluctuate up to that, then perhaps there is a degree of truth to it.

But the ceiling caused by the standard, if the standard has been properly set from the beginning, is certainly no problem.

Senator **Grassley**. Mr. Engwall, the defense industry, we are told repeatedly, is oriented toward "actuals"—that is actual costs, actual hours. Is that correct?

Mr. **Engwall**. No. We establish standards, and we establish improvement curve or realization factors in order to determine our manpower loading and in order to determine, basically, our costs. What we are really doing is estimating what actuals are going to be, because we recognize, depending on what point on the learning curve we are, that we very well might not be able to achieve standard; therefore, we are estimating actual by the improvement curve methodology.

Senator **Grassley**. I should clarify. DOD says the same, and we have internal memos that support that. But are you saying that that is not really the way it is?

Mr. **Engwall**. Well, actual costs are incurred against a given contract, at the contract level of reporting. The original targets that are set for the factory are based on standards and improvement curves.

Senator **Grassley**. Well, we are told by DOD that you do not even keep incurred cost data.

Mr. **Engwall**. That is correct. For the most part, incurred cost data is kept for the end product(s) contracted for; but we do not keep tract of how much the individual pieces cost.

Senator **Grassley**. I have a drawing of what is referred to as a "pulley-puller," which is made by Westinghouse. Actually, this drawing is a little larger than the actual size of the pulley-puller. It consists of a steel-based assembly and three screws.

I do not suppose you would know how much the company charged for that—actual cost, that is. GAO records show $6,005 in 1982, and that was the company's quote to General Dynamics, who purchased the pulley-puller. On August 12, 1983, general Dynamics submitted a quote to the Air Force, stating that General Dynamics had a firm quote from Westinghouse for $10,160. But the Air Force was not going to pay that much, and they beat the cost down to $8,800.

I can only say that this is what happens when you deal with actuals when there are no standards. I suppose there are many other examples that can be given, but I would like to have you answer this question. Are these prices based on learning curves? Will future prices fall according to learning curves? Are they calculated on the basis of a trend, or do we simply add inflation from year to year?

Mr. **Engwall**. That is not in my area of expertise as far as pricing goes. From an industrial engineering standpoint and our disclosure statements that I am familiar with, we come with costs based on standards and based on what point on the learning curve the contract is for. If something was taken out of production for a long period of time, or if there was a change in the rate of production as opposed to just the volume, or there were additional engineering specifications required, or there were additional military specificatoin callouts that in many cases tier down, particularly on spare parts, all of these factors influence the total cost. One has to look at that individual detail, sir, in order to answer that intelligently.

However, AIA will be glad to supply an answer for the record, if you give us the data.

[The following was subsequently submitted for the record:]

As previously stated I have no expertise in regard to the "pulley-puller". I have learned that the item called a "pulley-puller" is a Support Equipment Recommendation Data Package "SERD". Westinghouse has been providing information to the GAO (General Accounting Office) on the F16 Support Equipment Data Packages during the past 6 months which defines and substantiates data pertinent to the "pulley-puller" "SERD". All of this information will be available in the GAO report which is being submitted to Congressman John D. Dingell's subcommittee.

Senator **Grassley**. OK. I believe your testimony lends legitimacy to our interest in standard hour information and to more analysis of the variances we are seeing in the defense industry. I thank both of you for your testimony. If the intention here was to have an open and objective debate, I think we certainly accomplished that today. Again, I thank both of you.

Mr. **Engwall**. Thank you very much, sir.

Mr. **Castle**. Thank you.

Senator **Grassley**. Our second panel consists of Larry Hintze, an instructor for Army Management Engineering Training Activity, a division within the U.S. Army, and Mr. Albert Adlfinger, Chief of Management Engineering Office, Army Armament Munitions and Chemical Command, also within the Army, and Ompal Chauhan, the Chief of Manufacturing Operations Assessment Branch, with the U.S. Air Force.

I thank each of you for coming and I look forward to your testimony. We can start with Mr. Hintze, then Mr. Adlfinger, and then Mr. Chauhan.

STATEMENT OF A PANEL, INCLUDING LARRY L. HINTZE, INDUSTRIAL ENGINEER, U.S. ARMY MANAGEMENT ENGINEERING TRAINING ACTIVITY, ROCK ISLAND, IL; ALBERT C. ADLFINGER, CHIEF, MANAGEMENT ENGINEERING OFFICE, U.S. ARMY ARMAMENT MUNITIONS AND CHEMICAL COMMAND, ROCK ISLAND, IL; AND OMPAL S. CHAUHAN, CHIEF, MANUFACTURING OPERATIONS ASSESSMENTS BRANCH, AIR FORCE PLANT REPRESENTATIVE OFFICE, WICHITA, KS

Mr. HINTZE. Senator, my name is Larry L. Hintze. I reside with my wife and child in Eldridge, IA. I am a constituent of yours, by the way.

I am presently employed as an industrial engineer by the U.S. Army management engineering training activity, [AMETA], located at Rock Island, IL. AMETA can be characterized as a midsized consulting and training organization which is an integral part of the U.S. Army Materiel Command.

I was educated at the University of Iowa, where I received a bachelor of science of industrial engineering degree in 1966 and a master of business administration degree in 1970.

I am a registered professional engineer in the field of industrial engineering in the State of Iowa. I am a senior member of the Institute of Industrial Engineers. I am a certified instructor by the Method-Time Measurement Association to teach MTM–1, 2, and 3, all accredited time systems in work measurement and currently in use by DOD.

I served on active duty in the combat engineers as a Corps of Engineer Officer from March 1967 to May 1969. For 4 years of the 8 years that I served in the U.S. Army Reserves, I was a commanding officer of a combat engineer company.

Prior to being employed by AMETA, I worked for Wilson-Sinclair and the Square D Co., both located in Cedar Rapids, IA. At both locations, my primary duties involved improving methods and setting day rate time standards at Wilson-Sinclair and incentive time standards at Square D Co.

At AMETA, I teach and consult in the area of methods improvement and work measurement. For many years, I was responsible for the administration and the content of the defense work methods and standards course. DWMS is the basic course at AMETA which covers the procedures and techniques for improving methods and measurement of work. This is the standard DOD training course. Students who pass this course have the capability of using these skills to improve the productivity of their organization and to establish time standards.

Presently, I am responsible for the evaluation of defense contractors' work measurement systems [EDCWMS] course, the defense work measurement standard time data program [DWMSTDP] course, and the MTM–1, 2, and 3 courses.

Because of these responsibilities, I am currently updating and refining the course content of the evaluation of defense contractor's work measurement systems course. EDCWMS is the course that covers the procedures and techniques for those personnel required to implement MIL-STD 1567–A. Last fall, I helped to write the current draft of the implementation guidelines for MIL-STD 1567–A.

The courses that I teach at AMETA are: Evaluation of defense contractor's work measurement systems; defense work methods and standards; defense work measurement standard time data program; engineered performance standards for facility engineering estimators; MTM-1, 2, and 3; economic analysis for decision-making; work planning and control systems.

Some major consulting projects in which I was involved in the area of work measurement are as follows. At the request of Army should-cost teams, I evaluated the time standards at the Indiana Army ammunition plant at Charleston, IN, and at a Norris Industries plant in Los Angeles, CA.

At the request of the Corpus Christi Army Depot, I evaluated their plant to upgrade their work measurement program.

At the request of the Department of Justice, I determined the proper staffing of an assembly line of National Presto, Inc., in Eau Claire, WI. Before I was to testify at the trial on this matter, the case was settled out of court.

Thank you.

Senator GRASSLEY. Thank you.

Mr. Adlfinger?

Mr. ADLFINGER. Mr. Chairman, thank you for inviting me to testify today. I am Albert C. Adlfinger, Chief of the Management Engineering Office at Headquarters, U.S. Army Armament Munitions and Chemical Command, Rock Island, IL.

I have worked for the Army for 18 years. Prior to my Army employment, I worked in the private sector for 10 years. Of these 28 years of working experience, 25½ years have been spent in the work measurement field of industrial engineering.

Private sector companies where I have been previously employed with work measurement responsibilities include: Litton Industries, Data Systems Division, Van Nuys CA, senior industrial engineer responsible for administering work sampling and work simplification programs; Aeronutronics, Philco, Ford Motor Co., Lawndale, CA, senior industrial engineer and supervisor of work measurement; Litton Industries, Guidance and Control Systems Division, Woodland Hills, CA, senior industrial engineer responsible for designing a computerized production, work measurement and labor reporting system; Hughes Aircraft Co., Aerospace Division, El Segundo, CA, industrial engineer responsible for settting time standards; Northrop Corp., Nortronics Division, Hawthorne, CA, supervisor, manufacturing methods engineering, responsible for work measurement in all touch labor areas; Airesearch, Garret Corp., Los Angeles, CA, supervisor for time standards unit, responsible for establishing time standards for all manufacturing shops; Deere & Co., corporate offices, Moline, IL, industrial engineering assistant responsible for assisting in establishment of time standards.

My U.S. Army experience includes: Headquarters, U.S. Army Armament, Munitions and Chemical Command, Rock Island, IL, chief, Management Engineering Office, responsible for conducting efficiency reviews in white collar areas; U.S. Army Armament Materiel Readiness Command, Rock Island, IL, industrial engineer responsible for overseeing work measurement programs in all subordinate installations; U.S. Army Industrial Base Engineering Activity, Manufacturing Methods and Technology Division, Rock Island, IL, general engineer responsible for overseeing computer-aided design and computer-aided manufacturing projects; U.S. Army Management Engineering Training Activity, Rock Island, IL, industrial engineering responsible for teaching, consulting, and research for Department of Defense in work measurement, economic analysis and work planning and control systems.

I was educated at the University of Illinois, where I received bachelor of science degree in industrial engineering, with additional graduate work accomplished at the University of Iowa.

I am a senior member of the Institute of Industrial Engineers.

I am a registered professional engineer in the field of industrial engineering in the State of California. I have been a certified method-time-measurement, MTM-1 and MTM-2 applicator and have received training in MTM-4M and Maynard operation sequence technique work measurement systems.

I have extensive experience in the area of work measurement and standards, learning curves, economic analysis, computer-aided design and computer-aided manufacturing. My work experience encompasses detailed time standard development and application using a cross-section of industrial engineering work methods and work measurements techniques, such as flow process or procedures charting, layout/flow diagrams, time study, predetermined time systems, standards data and work sampling.

Additional experience includes planning, directing and controlling the management of work measurement programs and offices. The majority of my private sector experience has been in aerospace industries which provide components or systems to Department of Defense services.

Work measurement is, in simple terminology, an evaluation of work in terms of time. Work measurement is defined more specifically as the determination of the required time to perform a specified amount of work or work unit. It results in a statement of a time standard for performing a job and a description of the job—that is, methods, tools, equipment, training, quality and performance.

The simplest type of activity requires a knowledge of how long the activity takes for effective operation. As an organization or system, et cetera, increases in size and complexity, the basic information of how long the activity takes becomes of greater importance to maintain management control.

Work measurement is an excellent management tool which provides quantitative information for programming and planning work and for scheduling the use of personnel and facilities. Work measurement data can also be used for appraising organizations, contracts, systems or end items and evaluating the status of various operations.

The work measurement data will provide management a means of controlling costs, operating efficiency, staffing requirements, equipment, machines, tools, facilities requirements and productivity measurement.

I would like to exercise my option of submitting more complete testimony for the record at a later date.

Senator GRASSLEY. Within 15 days

Mr. **Adlfinger**. Thank you.

Senator **Grassley**. Mr. Chauhan.

Mr. **Chauhan**. Thank you, Mr. Chairman.

I am Ompal Chauhan, chief of manufacturing operations assessment branch, Air Force plant representative office at the Boeing Co., in Wichita, KS.

I have worked for the Air Force for 9½ years, and my entire civil service career has been in the procurement field. During the last 6 years, I have dealt extensively with the subject of work measurement. During my tenure at Headquarters Air Force contract management division I coordinated with all of the services, and have evaluated and used work measurement data for evaluation of contractors' performance.

So, Mr. Chairman, when I talk about work measurement, I am talking from direct experience and knowledge by virtue of being an implementer and user of the system.

Mr. Chairman, the Air Force has conducted several studies and surveys in the past 20 years. Each one of those studies concluded the need for and value of a good work measurement system. It is because of the continuous determination of the defense industry and our lack of corporate knowledge over previous experiences that we have not been successful in implementing these requirements for all of the contractors.

In March 1966, Major General Keeling stated that price analysis and review techniques should include analysis of contractors' use of engineering standards in developing cost proposals. Mr. Chairman, after 20 years of studying and analyzing this issue it remains an open issue.

In August 1966, AIA endorsed Air Force Systems Command objectives to reduce fact-finding and estimating costs and considered it feasible to use engineering standards for pricing and negotiation. Yet, 19 years later, it remains an open issue.

In September 1979, Aerospace Industries Association, referred to as "AIA", which represents the different industries, surveyed 53 major companies and concluded universal use of labor standards for labor planning and control was appropriate, and 72 percent of labor was covered by engineered standards. Yet, 15 years later, we still continue to study this issue.

Lyon's study in January 1971 concluded the need to MIL-STD on work measurement. Fifteen years later, today, we still have not been fully successful in implementing this standard.

The Sagamore study, conducted by Air Force and the industry, concluded that 45 percent of the labor on typical aircraft assembly was nonproductive. A later GAO audit contained reports of similar deficiencies and recommendations that improvements in labor standards could significantly reduce costs. Fifteen years later, today, the situation has not changed, and the use of labor standards remains an open issue.

In March 1973, a study conducted by the AFCMD concluded that all contractors have some form of work measurement system. This finding was reconfirmed by a study in 1983 by the same office.

In 1973, Project ACE Production Panel recommended developing an Armed Services Procurement Regulation [ASPR] clause. Generally, the ASPR clause would require DOD contractors to implement work measurement in all development contracts. Even though the draft of this clause was developed by the Air Force Contract Management Division, 12 years later, we are still struggling with the issue and have not developed this clause for implementing on the DOD contracts.

In May 1974, finally, a charter was established, and 2 years later, in 1976, a work measurement standard was published.

In September 1977, encouraged by the benefits of the Air Force standard, a panel was established to develop a standard for the DOD, and 2½ years later, this panel completed its work and submitted a MIL-STD draft for DOD publication to the joint logistic commander who, on September 10, 1980, recommended triservice adoption of the proposed work measurement standard for all the three services.

Mr. Chairman, due to manipulation of the DOD system by the defense industry, this standard was not published until 2½ years later, in March 1983. Two years later, today, in 1985, Mr. Chairman, there are very few DOD contractors with the requirement of this standard.

Mr. Chairman, the defense industry has successfully manipulated our system to evade this accountability issue. Their reason for delaying and avoiding this issue is understandable, but certainly not acceptable.

Mr. Chairman, the benefits of a good work measurement system far outweigh its cost. Even though I agree that direct manufacturing is only a small portion of the cost, this is the most important cost element which is controlling the other elements of the cost, and it is therefore extremely important that this element be controlled properly.

The example cited on page 22 of my written statement is an example of how overall program management costs can be managed and controlled by use of the labor standard. Benefits from a work measurement system range from 15 to 30 percent of the direct manufacturing labor. Industry does not want to use standard because of the visibility it provides.

Mr. Chairman, the studies and surveys conducted both by the industry and the Government for the past 20 years point to the same conclusion—that is, work measurement is a good tool for production management and cost control and provides an extremely good estimating tool both for the industry and the Government. Contractors routinely use standards for their own internal estimates, but what they are reluctant to do is to share this information with the Government. The example cited on page 14 of my statement illustrates the differences between estimates based on standards and other techniques. The standard estimate base makes them more accountable. However, many defense contractors do not want to face this accountability issue.

Finally, Mr. Chairman, I believe the work measurement is a good tool for both the industry and the Government to control cost, and the simplest way to enforce the requirements of the standard is to develop a Federal acquisition or regulation clause to require all major defense contractors to have work measurement systems in plants in order to bid for the Government contracts.

Mr. Chairman and members of the committee, I appreciate you giving me this opportunity to appear before you and discuss with you an issue germane to cost-effective military procurement, a sound work measurement system.

Now, Mr. Chairman, I will answer any questions you have. That concludes my statement.

[Statement follows:]

PREPARED STATEMENT OF OMPAL S. CHAUHAN

MR. CHAIRMAN:

I am OmPal Singh Chauhan, Chief of Manufacturing Operations Assessment Branch of the Air Force Plant Representative Office at Boeing Plant in Wichita, KS. I have worked for the Air Force for 9 1/2 years. My entire civil service career has been in the procurement field and has included detachment positions at Boeing, Seattle; General Dynamics, Fort Worth; HQ AFCMD; and Boeing, Wichita. I appreciate the opportunity to appear before you and to discuss with you an issue germaine to cost effective military procurement, a sound work measurement program.

During the last six years, I have dealt extensively with the subject of work measurement. Mil-Std-1567 is a set of work measurement criteria and implementation instructions. During my tenure at HQ AFCMD, Albuquerque, one focal point of my work was coordination of Mil-Std-1567A implementation with 25 AFCMD detachments, five product divisions, HQ AFSC, HQ AF and SAF, the Navy, and the Army.

During my tenure at HQ AFCMD, I coordinated Mil-Std-1567A for publication and use by all branches of military service. The Mil-Std-1567A implementation guide currently in use by the Air Force and by the other services was developed by me during this time.

During the last six years, I have utilized work measurement data in evaluating performance of various contractors including, but not limited to, Hughes, Boeing, General Dynamics, Raytheon, AVCO, and Northrop.

So, when I talk about work measurement, I am talking from direct experience and knowledge and by virtue of being a developer, implementator, and user of this system for the last six years.

HISTORY

The need for a Mil-Std covering a work measurement system was brought to the Air Force's attention and was given high priority as a result of several studies and surveys conducted over the past 20 years.

February 1966

A memo from Ernest Fitzgerald to Mr. L. Marks (ASAF) reviewing cost control procedures in the FIII program cited almost complete lack of work measurement in manufacturing function.

This memo raised doubts as to validity of contractor's cost proposals.

March 1966

M/GEN Keeling stated that price analysis and review techniques should include analysis of the major contractor's use of engineered standards in developing cost proposals. He also stated that an I.E. team should review and evaluate on a recurring basis, a contractor's use of engineering standards.

Headquarter's AFCMD directed AFPROs to conduct a review of their contractor's use of labor standards for both internal control and for estimating purposes. No information was forthcoming as to how many contractors were actually using labor standards in their estimating systems.

April 1966

Headquarters AFCMD discussed possible problems if Government imposed a requirement for work measurement for internal control and proposal estimating.

June 1966

As a result, a letter by LT. GEN. W. A. Davis, Headquarters, AFSC, was sent to all Air Force contractors requesting opinions of labor standards and their use.

Results (21 plants). Three contractors answered directly to Headquarters, AFCMD. Twelve contractors chose to provide data to AIA. Six provided no response. Three contractors stated work measurement was basic tool for internal planning and control. Only one used work measurement in cost estimating.

August 1966

Consolidated reply from AIA cited wide range of conditions to which industry contributed "standards" from statistical standards to quantified data.

AIA Conclusions: AIA endorsed AFSC objective to reduce fact finding and negotiation time and to improve contractor's cost estimating.

AIA considered it feasible to use engineering standards for pricing, negotiating, and estimating in large volumes, repetitive types of operations of aerospace industrial activities.

AIA recommended use of standards should be determined on case by case basis - best left to discretion of individual company.

September 1970

AIA Report, "Manufacturing Labor Productivity", a summarization survey of 53 companies of which 47 returned survey. Major conclusions:

a. Almost universal use of labor standards for labor planning and control.

b. Only one company did not use standards.

c. Two thirds used standards in indirect areas.

d. Forty-four gave definition of standards - 80 percent agreed with AIIE description.

e. Those who reported highest savings vs. cost ratios were those who measured by group and used standard data rather than time studies.

f. Seventy-two percent of productive labor hours covered by engineered standards indicated planned increase in coverage.

Lyon's Study January 1971

The Air Force Production Management Study, published in January, 1971, under the direction of General Lyon, described several needs in the area of improved management of the production function. It found Air Force management preoccupied with performance goals, neglecting the production management function; production engineering consideration not effectively implemented; production readiness not assessed prior to the production decision; and production risk not effectively identified.

The most significant finding demonstration, the need for a Mil-Std, was that contractual instruments were not definitized for effective control of the production process.

Sagamore Study

A later study conducted in Sagamore, New York, undertaken by Air Force materials lab people as well as representatives from 25 contractors, further indicated the need for more productive lab or manhours. It concluded that 45 percent of the labor manhours on typical aircraft assembly -- even at Plane Unit 1000 -- were nonproductive.

GAO Audit

Other surveys including GAO audits contained similar deficiencies such as: Manufacturing labor was idle as much as 32 percent of the time; productivity in many departments was as low as 61 percent; overall efficiency of some plants was no more than 68 percent; and improvements in labor standards could significantly reduce costs.

1973 Project Ace

In 1973, the acquisition cost evaluation study was undertaken at the direction of the Commander, Air Force Systems Command. Its charter was to identify cost drivers in the acquisition process. The trend even then indicated our armed forces would be in jeopardy unless costs could be reduced.

March 1973

Col. Mewha requested that all AFPROs conduct a Work Measurement System Analysis. AFPROs reported that every one of their contractors used standards to some degree for labor planning and for budgeting.

Coverage of direct labor ranged from 31 percent to 100 percent of direct production hours.

Eighty-three percent of companies had more than 75 percent of their production hours covered by standards.

The quality varied from 100 percent engineered to 0 percent. Slightly more than 1/2 of contractors have more than 50 percent coverage of hands-on labor by engineered standards.

Two companies had effective work measurement systems: One had 100 percent coverage with all engineered standards; the other had 83 percent coverage with 85 percent engineered standards. Both used labor standards to estimate labor costs in price proposals, establish shop loads and schedules, work station layout and methods analysis.

Also, labor standards were used for cost of engineering changes, spares, and replacement parts. Every company has some method of Labor Performance Report. Most on weekly basis. Some used % efficiency figures, others used labor factors (reciprocal of % efficient). Three contractors summarized weekly reports into monthly reports, and in one case, monthly reports into yearly reports. Only 65 percent of the contractors used Electronic Data

Processing. Six (30%) of the contractors audited their labor standards, but only two of these were considered adequate.

Quality Standards - Good quality standards are considered necessary. In 14 of the 16 plants, the people who develop the labor standards were considered qualified.

Staffing - Ranged from one I.E. for every 26 workers to one I.E. for 240 direct labor employees.

Less than 1/2 of the contractors use labor standards or targets in the development of cost proposed direct labor hours.

Three plants used the target hours as estimates. Another used the standard hours modified by a realization factor to predict the actual hours to be used.

1973 Project ACE

As a result of Project ACE Production Panel Findings, a proposed MIL STD and implementing ASPR clause was developed.

Generally, the ASPR clause would require:

1. DOD contractors implement work measurement in:

   a. All development contracts where it is estimated that total accumulative financing will exceed $25M, and all production contracts where annual expenditure will exceed $5M or cumulative to exceed $25M.

   b. All work measurement system provisions be included in the solicitations that meet dollar thresholds and must meet criteria of work measurement Mil-Std.

   c. All work measurement Mil-Std would require that the contractor establish work measurement system for improved productivity in areas applied.

2. Representative systems criteria:

a. Provisions of Mil-Std applicable to purchase orders or subcontracts which exceed $1M unless waived by contracting officer.

b. Contractor shall develop engineered labor standards utilizing recognized I.E. techniques.

c. Standards shall cover all touch labor.

d. Labor Standards shall have total usage.

e. An analysis shall be made of all variances.

May 1974

Finally, with the seriousness of the situation pointed out by this acquisition cost evaluation, backed up by the previous study; a charter to develop a Mil-Std was established. In 1973 and 1974, a draft of the work measurement Mil-Std was developed. In June of 1975, USAF Mil-Std-1567, Work Measurement, was published.

Having developed the Mil-Std, the bigger job of implementation lay before us. It became obvious that this would be a vehicle to carry out the mission being emphasized not only by our own Air Force Systems Command, but also by the United States Air Force as identified in a letter dated November 1976 from the Principal Deputy Assistant Secretary of the Air Force (Financial Management).

September 1977

Encouraged by the benefits of the Air Force Standard, a Joint Logistic Commander Panel was established to develop a DOD Mil-Std on work measurement.

October 1978

When the National Productivity Council was established by President Carter in October 1978, it emphasized the continuing need for tools such as Mil-Std-1567 to improve productivity so vital to our overall national economy.

8 April 1980

The task of developing Mil-Std-1567A was completed and was submitted to Joint Logistic Commander Panel for manufacturing production.

10 September 1980

The Joint Logistic Commander's offices of prime responsibility for the JLC Panel on Manufacturing/Production Management recommended to the tri-service adoption of the proposed work measurement standard.

March 1983

DOD Mil-Std-1567A was published after extensive negotiations between the Air Force and the DOD and the industry association.

ESTIMATING

Mr. Chairman, we are of the opinion that use of standards for estimating when available for follow-on and spares programs is the best available tool both for the Government and the industry to scientifically arrive at an estimate. We will have better confidence in the estimates so prepared. If we look at the following example, it will be clear to you why the contractors are reluctant to use standards for estimating. In this example, the contractor used historical data or detailed estimates to prepare his proposal; we used standard. The results are summarized below.

EXAMPLE

PROPOSAL NO.	SET-UP	REMARKS	RUN TIME	REMARKS
	Time Change Indicated		Change Indicated	
A	4%	REDUCTION	56%	REDUCTION
B	15%	REDUCTION	32%	REDUCTION
C	78%	REDUCTION	78%	REDUCTION
D	29.5%	INCREASE	47.3%	REDUCTION
E	30%	REDUCTION	77%	REDUCTION
F	15%	REDUCTION	31%	REDUCTION
G	36.52%	REDUCTION	24.95%	REDUCTION
H	2.2%	INCREASE	52.64%	REDUCTION

* Reduction based on standards.

Mr. Chairman, it is very important for the Government to negotiate a realistic touch labor because of the impact on direct and indirect support labor costs.

For each touch labor hour, two direct support hours are assumed. Direct labor hour = touch labor + direct support # .. 1 + 2 = 3 hours.

For each direct labor hour, there are three fringe and overhead equivalent hours. Total hours = 3 x 3 = 9.

For each overstated touch labor hour, there are 8 hours of spin-off hours. The Government has significant interest in negotiating a realistic touch labor hours number.

AIR FORCE CURRENT POSITION ON ESTIMATING:

If industry and the Government want to realize full benefits of the work measurement system, we must use standards for estimating when available. Air Force Systems Command has published AFSCR 550-8 dated 30 April 85 clarifying the Air Force's position on use of labor standards for estimating. Copy attached. (Atch 1)

BENEFITS/IMPLEMENTATION COSTS

In 1982, we conducted a survey of 15 commercial contractors. These commercial contractors were chosen at random from the list of MTM association membership. Each one of the respondents has more than 15 years of experience in use of work measurement system. All of the respondents use work measurement and stated they could not stay competitive without an effective work measurement system. Cost avoidance attributable to a good work measurement system range between 15 and 30 percent.

Mr. Chairman, because of the multiple uses of the work measurement system, i.e., budgeting, estimating, shop loading, planning, and estimating, it is difficult to precisely put a figure on the cost savings/avoidance due a good work measurement system. However, based on the expert opinion of these people, 15 to 30 percent is a conservative estimate. These figures have been confirmed by an earlier study conducted by AFCMD in 1978.

In June 1985, Mr. Arif Mir, HQ AFCMD representative, met with Mr. Zandin from HB Manyard Company, Mr. Don Clark, Chairman of the MTM Association, and Mr. Charles Merril, from Management Sciences Associates (MSA). All of them are the providers of the work package for the work measurement, and they all agree that cost avoidance of 15 to 30 percent is definitely achievable due to an effective work measurement sytem.

Air Force Contract Management Division semi-annual cost savings report which is collected from all AFPROs indicated a minimum return on investment of 1:3 and as high as 1:20 depending on the maturity of the program and maturity of the system available in the contractors' plant when work measurement is used.

REDUCTION IN PROPOSAL PREPARATION AND EVALUATION TIME

When a contractor is required to prepare and submit his proposal for follow-on buys, spares, and changes using Type I Standards, the only questionable item is the variance to Standards. If the variance is prenegotiated, a sample check of the selected parts could easily verify validity of the proposal. Therefore, negotiations are practically a formality. On the other hand, when proposals are prepared using other acceptable techniques, significant time is required for fact finding and proving or disapproving the validity of the data used to prepare the proposal. An estimate of reduction in proposal evaluation time by a factor of 5 is easily attainable when work measurement is used. Usually it would be higher depending upon the ability and familiarity of the user with this technique.

WHERE THE SAVINGS COME FROM

*Setting standards sets methods.

*Setting standards sets performance targets.

*Setting standards sets base for cost estimates.

*Measuring to standards identifies problems.

*Improving methods and supervision attacks problems.

*Auditing standards assures benefits from methods improvements and generates confidence in the time standards.

Mr. Chairman, in our continuous search for an effective cost control system and better accountability through use of the work measurement system, AFCMD undertook the following study on 31 October 1983: A Study of Application of Mil-Std-1567 on AFCMD Administered Contracts. This study was submitted to General Robert T. Marsh, Commander, Air Force Systems Command. The results of this study are summarized below.

HQ AFCMD STUDY OF MIL-STD-1567 ON AFCMD ADMINISTERED CONTRACTS

OCT 1983 SUMMARY

There are 193 contracts which meet the criteria for application of Mil-Std-1567 based on our criteria of $20M annually and $100M cumulatively.

There are 53 contracts with Mil-Std-1567 requirements, 37 of these contracts have reduced Mil-Std-1567 requirements and 16 contracts have Mil-Std-1567 requirements in full.

All contractors surveyed could meet Mil-Std-1567A requirements with minor modification.

There is an apparent reluctance amoung the buying community to place requirements of this standards on contract; and when the requirements are placed on the contract, they are being arbitrarily tailored, normally in favor of the contractor.

We cannot be fully successful in implementing Mil-Std-1567A requirements unless we have the contractual enforcement of the Mil-Std.

We recommend AFSC/PM revise AFSCR 800-9 to require placing Mil-Std-1567 requirements on all contracts which meet the criteria for application. Any waiver, deviation or tailoring should be subject to approval by AFSC/PM on the recommendation of AFCMD.

We are certain that you will have some opposition from the buying offices, but it is in our best interest to incorporate these changes.

Mr. Chairman, as a result of this study AFSCR-800-9 has been revised to incorporate all the recommendation of this study, and the Air Force is placing requirements of Mil-Std-1567A on all current program unless there are reasons to wave the requirements based on cost vs. benefit considerations. Unfortunately, our progress in implementing Mil-Std-1567A has been extremely slow.

A copy of this complete study is provided as Attachment 3 to my statement.

BENEFITS OF MIL-STD-1567A

*Impact on touch labor = 20%

*From:

- Increased Efficiency
- Increased Control
- Better Methods
- Better Base of Measurement
- Better Work/Man Loading

*Impact on procurement = 5%

*From:

- Better Work Definition
- Improved Ability to Price
- More Competitive Contractor Make or Buy
- Less Tolerance of Subcontractor Inefficiency
- Mil-Std Flow Down in Some Cases

*We must compare our past and current performance to measure efficiency.

*Provides Government and industry a tool to compare "Should Cost" and "Did Cost".

*Visibility into the efficiency on a continuous basis provides for timely corrective action.

Mr. Chairman, one of the most significant benefits of an effective work measurement system is that it provides us an effective tool to monitor program costs based on the concept of cost of labor per standard hour work content which is computed by:

$$\text{Cost Per Std Hrs of Work Content} = \frac{\text{Total Cost - Material Cost}}{\text{Std Hrs. Work Content}}$$

As you progress in production, this cost should decrease because of decreased support cost. As is evident from the examples which I worked from the Raytheon Company, the technique of balance between work content and man loading can be effectively used for discovering a term called front loading on new programs.

EXAMPLES OF COST PER STANDARD HOUR

RAYTHEON COMPANY

HAWK COST PER STANDARD HOUR

MISSILE

ASSEMBLY = $116 UNIT DOLLARS @ TCL

TEST & INSPECTION = $ 95 UNIT DOLLARS @ TCL

GSE

ASSEMBLY = $268 UNIT DOLLARS @ TCL

TEST & INSPECTION = $265 UNIT DOLLARS @ TCL

Unit dollars include proration of:

Engineering

Production Control

Manufacturing Overheads

G & A

ANDOVER PLANT

PATRIOT PRODUCTION

ONE STANDARD HOUR

MISSILE

ASSEMBLY	$173 Unit Dollars @ TCL
TEST & INSPECTION	$183 Unit Dollars @ TCL

GSE

ASSEMBLY	$202 Unit Dollars @ TCL
TEST & INSPECTION	$164 Unit Dollars @ TCL

UNIT DOLLARS INCLUDES PROPORATION OF:

*ENGINEERING

*PRODUCTION CONTROL

*MANUFACTURING OVERHEADS

*G & A

PRODUCTION IMPROVEMENTS

RLPR - 21D

LABOR COST PER STANDARD HOURS

ECAC

TCL LABOR PROGRAM		COST (000)	FAB ASSY STD. HOURS	LABOR $ PER STD HOURS
7M	FY'80 - 390 LOT	$ 41,659	149,271	$ 278.24
7M	FY'81 - 1490 LOT	75,033	00,044	150.05
9M	FY'81 - 1884 LOT	28,534	41,865	201.13
AOTD	FY'81 - 1028 LOT	3,766	22,410	168.05
AOTD	FY'81 - 2348 LOT	5,056	50,717	99.69

UNIT DOLLARS INCLUDES PRORATION OF:

*Engineering

*Production Control

*Manufacturing Overhead

*G & A

Mr. Chairman, the subject of work measurement is not new. Some form of work measurement system has been in use for a long time. A study conducted by the MTM Association on Project MC-72 in September 1970 concluded that there was almost universal use of the labor standards for labor planning and control. A copy of this study is provided as an Attachment 2 to this statement.

As early as 1976 and earlier, we have determined that the commercial airframe industry has, and still does, use work measurement as a management tool.

In June 1976, a study entitled "Mil-Std-1567 Acceptance Study" concluded that standards were being used by all participating commercial contractors for production management. Following are the findings and recommendation of this report.

MIL-STD-1567 ACCEPTANCE STUDY THAT HAVE COMMERCIAL BUSINESS JUNE 1976

This study was conducted by Mr. D. E. Moore, Deputy Director of Manufacturing, HQ AFCMD, and submitted to Brig. Gen. Driesnack. The findings of this study are summarized below.

1. Four companies were selected based on the volume of commercial business.

   a. Beech Aircraft, Wichita, KS.

   b. Cessna Aircraft, Wichita, KS

   c. Gates Learjet, Wichita, KS

   d. Piper Aircraft

2. Beech: Uses labor standards for control of all types of labor. They have one industrial engineer per 200 workers, a ratio of 1:200 complete coverage of all production work.

3. Cessna: Uses combination of time study and predetermined time system. About 60 percent of direct labor is covered by Type I standards.

4. Gates Learjet: Uses historical basis for estimates and performance measurement.

5. Piper has recently intensified their work measurement activity under a new vice president. They are using MTM, time study, work sampling, and standards data in this effort. They have coverage of about 90 percent in assembly and 70 in machining.

Air Force Contract Management Division conducted another survey in Feb 1982 entitled "Use of Labor Standards for Estimating and Negotiation". The findings and recommendations of this survey are summarized below.

SUMMARY OF AFCMD STUDY USE OF LABOR STANDARDS FOR ESTIMATING AND NEGOTIATION FEB 1982

There was a unanimous consent that use of labor standards provides a better base for estimates.

Contractors prefer to use actuals and are often reluctant to use standards.

We should place Mil-Std on all contracts which will provide a means of getting standards estimates for future proposals.

PROBLEMS

. Contractors have successfully evaded our efforts to implement some type of a disciplined work measurement system. They have been extremely successful so far in evading this accountability issue even though Mil-Std-1567 is an excellent tool for cost control.

The main reason for contractor reluctance to implement Mil-Std-1567A is Government visibility and use of standards for estimating.

The question now, Mr. Chairman, is should we allow them to get away with this?

Mr. Chairman, I thank you for your interest in this important cost control tool. Now, I will answer any questions you may have.

ATTACHMENT 1

DEPARTMENT OF THE AIR FORCE
Headquarters Air Force Systems Command
Andrews Air Force Base DC 20334-5000

APSC REGULATION 550-8

30 April 1985

Commander's Policies

USE OF LABOR STANDARDS IN CONTRACT PRICING, NEGOTIATION, AND MANAGEMENT

This regulation establishes the AFSC Commander's policy on use of labor standards in contract pricing, negotiation, and management. It applies to HQ AFSC and AFSC field activities.

1. Military Standard 1567A, Work Measurement. MIL-STD-1567A must be consistently applied to all major system acquisitions. When on contract, the provisions of the military standard must be fully exercised.

2. Use of Labor Standards:

a. Contractor Duties. When MIL-STD-1567A is on contract, contractors must be required to use labor standards, when available, consistent with recognized cost accounting methods, to develop budgets, plans, and schedules; to form a basis for pricing and negotiations; and to baseline performance. "Actual" costs from earlier acquisitions cannot be accepted without careful scrutiny.

b. Government Duties. Whether MIL-STD-1567A is on contract or not, government representatives must use labor standards, when available, in a manner consistent with other recognized cost accounting methods, to plan, program, and budget acquisitions; negotiate contracts; and monitor subsequent contractor performance. If MIL-STD-1567A is not part of a contract, but the contractor has independently developed labor standard information, government representatives should ask for such information as part of the "fact finding" process. In this case, special contract clauses may have to be developed to allow the government to monitor contractor performance against labor standards.

3. Compliance with this Regulation. Program managers must make sure labor standards are used in pricing, negotiating, and managing contracts.

Lawrence A. Skantze

LAWRENCE A. SKANTZE, General, USAF
Commander

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ATTACHMENT 2

AEROSPACE INDUSTRIES ASSOCIATION
MANUFACTURING COMMITTEE

FINAL REPORT OF PROJECT MC-72
MANUFACTURING LABOR PRODUCTIVITY

September 1970

COMPANIES REPRESENTED

N. Amer. Rockwell
Rohr Corporation
Grumman Aerospace
Lockheed Sunnyvale
Goodyear Aerospace
TRW
Boeing
Curtiss-Wright Aerospace
Lockheed, Georgia

OBJECTIVE

To provide a medium for review of information on aerospace manufacturing labor planning and control from a time standard base.

SCOPE

Encompasses collection and review of information on development application and use of time standards for manufacturing as used in aerospace. Information will be collected by questionnaire. Project activities and conclusions will be documented in a report to the MC.

CONDUCT

Fifty-three companies received questionnaire. Forty-seven questionnares were returned and summarized.

CONCLUSIONS

1. Almost universal use of standards for labor planning and control of production labor. Two-thirds of respondents use

standards for measuring some portion of indirect or manufacturing support activities. Less activity in measuring indirect labor.

2. Organizational placement had little to do with respect to standard's effectiveness as shown by reported savings vs. costs ratios. Some claimed savings of their savings vs. costs from 2:1 to over 5:1.

3. Companies with highest ratios tended to measure by group and also to use standard data.

4. Labor performance reports on a weekly basis are by far most common.

5. Allowances for PF&D average around 13 percent with none below 5 percent and none above 22.5 percent.

6. Envisioned that in the future standards will be used more extensively for purposes such as computerized shop loading, product and design evaluation, and indirect work measurement.

7. Both supervision and production workers are aware of standards. One-third respondents use operator performance to standards for disciplinary action.

8. Seventy-five percent used electronic data processing terminals for data collection and a like percentage provides for non-productive labor and delay reporting.

9. Seventy-two percent of production labor hours are covered by engineering standards with a marked indication of planned increase of coverage and no planned decrease.

10. Data from respondents indicates that personnel responsible for establishing and maintaining standards system tend to be somewhat satisfied with current techniques and collectively envision a need for more of the same.

Senator GRASSLEY. Before I go to questioning, I want to say that you gentlemen are here on the panel because you have hands-on experience out there in the field, specifically, within our military services. We would expect to get many answers from you.

Mr. Chauhan, you mentioned in your testimony that the defense industry does not want to use standards because of visibility. I would like to have you elaborate on that.

Mr. CHAUHAN. Mr. Chairman, yes. They use the standards for estimating for their own purposes. But they do not like to provide the same set of data to us. They like to use actuals, which is significantly higher than the standard.

In the examples I have cited, there is a reduction in the work content proposed by the contractor up to 76 percent, and industry, if they do provide us the estimate based on their actual can pretty much get away with it. But the standard makes them more responsible, more accountable to answer, and they have to settle with significantly less labor hour cost than they are doing currently.

Senator GRASSLEY. Do you think they can achieve standards?

Mr. CHAUHAN. Yes, sir, they definitely could. I think in the beginning, over a period of time, this problem has not started today. It was a problem long before I joined the Department of Defense. I used to be a social worker, and I think the example of "welfare queens" fits the Department of Defense contractors very well. I saw people that were on welfare who have been on welfare for generations, and they had themselves convinced that they could not work, even though I knew they could work. So I think among defense contractors it has become sort of a tradition and an accepted practice that inefficiency is a way of life, and that is how it is supposed to be. The private or the commercial industry cannot exist like this in the competitive market.

The mandate for accountability will not come from the contractors. It must come from the Government.

Senator GRASSLEY. I have a series of questions for Mr. Chauhan, and then I have a series of questions for the other two gentlemen on the panel. I favor this as opposed to going back and forth. I have divided it this way because of you two being from one service and Mr. Chauhan from the other.

Some individuals have questioned the utility of having work measurement data made available to either DOD or to the Congress. Can you tell the subcommittee exactly how such things as actual to standard labor hour comparisons and performance ratings could be useful to know?

Mr. CHAUHAN. Mr. Chairman, those ratings are absolutely important. In the defense industry—it is not bad to be bad, but it is bad for other people to know about it. That is what they are afraid of when they show this data to the Congress or to the Government. We can point out where the inefficiencies are, and of course, naturally, we would expect them to do better. But as long as they can keep you in the dark and keep supplying this "did cost" stuff, or the actual cost data, and we keep buying it, there is no reason, or incentive, for them to provide us with work measurement standards data.

Now, their profit also is based on the actual cost, or the negotiated cost. If the negotiations are based on standard, of course, the price will be less and their profit will be less. But if they can negotiate based on the actuals, that automatically increases their profit, plus in the future, when we look at the actual cost history, which is higher, we will be going to the next buy, and we buy it based on that, so they can negotiate a further higher price.

So I think it is a lot of incentive for them not to do it, but I do not believe the Defense Department should let them get away with it.

Senator **Grassley**. How is this work measurement data currently used in the Air Force, and I want your judgment on whether it ought to be used more widely.

Mr. **Chauhan**. Well, Mr. Chairman, we do try to use it for cost proposal evaluation and for performance evaluation on the contracts that we have administrative responsibility over. But we are in a constant struggle with the contractor. We are in an arm's struggle every day. We keep asking, and they are not giving the data. So it is very difficult to get the data, and when we manage to do our side of the estimate based on the standard, some of our own contracting officers go back and negotiate based on the actuals.

Senator **Grassley**. What encouragement or barriers have you experienced in either using or collecting this work measurement data until MIL-STD 1567-A came along?

Mr. **Chauhan**. We were not getting anything at all. We still do not, but some of the contracts have MIL-STD 1567-A and we can get some of the data on these contracts.

Senator **Grassley**. In other words, it has not improved any under the standard, the MIL-STD?

Mr. **Chauhan**. It has improved some, but not as much as expected.

Senator **Grassley**. So you have not received any encouragement. What you are saying basically, is that there are barriers?

Mr. **Chauhan**. Yes, sir. Now, there are contractual provisions that we can withhold progress payment or penalize the contractor for not performing to the contractual requirements, but this is rarely done. To be honest with you, Mr. Chairman, withholding the progress payment of the contractor is considered unethical in our business, and there is more pressure on the person who recommends taking such an action than on the contractor.

Senator **Grassley**. In your dealings with defense industry representatives, what have you perceived their position on work measurement to be?

Mr. **Chauhan**. Mr. Chairman, the position of the industry—can be summarized by this internal memo from one of the companies, which confirms what we have perceived their position to be. I will not name the company. But the company says:

> The company has taken the party line position to resist at all costs and when all is lost, to carefully tailor the MIL-STD to fit within the individual component system.

Their position is that we delete the requirement to price future contracts based on standards. They want the flexibility to consider actuals. I think that, basically, summarizes the overall industry and why they want to fight. They will use every possible technique, including creating confusion within our own DOD management, if that serves their purposes.

Senator GRASSLEY. I asked a previous panel whether the industry was oriented toward actuals. You heard that comment.

Mr. CHAUHAN. Yes, sir.

Senator GRASSLEY. What is your reaction?

Mr. CHAUHAN. They definitely are oriented toward actuals, because it is definitely not in their best interest to provide estimates based on standards, because they can get more, and they are profit-oriented companies, so they will use the technique which is most profitable to them, and actuals are most profitable.

Senator GRASSLEY. I would like to ask the other two panelists to respond on the question of actuals. What is your reaction to what Mr. Chauhan has just said? Are you in agreement or disagreement?

Mr. HINTZE. Senator, I am an engineer and have not been exposed to much contracting, but talking to AFPRO's and DCAS personnel in my classes, many indicate that contractors prefer using actuals.

Many managers do not want to use standards for several reasons. Regardless of how the contract is written, the perception is that the more the weapons cost, the more profit for the defense contractor. Having a disciplined work measurement system would reduce the costs and, therefore, reduce profits.

Another point concerns accountability. Regardless of the level of management, when you have time standards, upper level management knows what should be accomplished by your organization. If you do not achieve that standard, then you must explain the discrepancy of actuals and the standard. Management must manage their organization more than they are at present. And that is one reason why many managers dislike the use of time standards.

Senator GRASSLEY. Mr. Adlfinger.

Mr. ADLFINGER. Mr. Chairman, I have not been privileged on the cost end of it myself, either, but I have heard basically the same things as what Mr. Hintze has said, that the contractors tend to go toward the actual cost dollars, or the actual hours, instead of using the standards.

Now, I have worked in several of these companies, aerospace type companies, as you noted from my testimony earlier, and in these companies, I had responsibility for either calculating the percent efficiencies or actually having the responsibility of providing them up to management. And at the worker level, where industrial engineering established these standards, from my experience, in the days that I worked there, the standards appeared to be pretty good standards. Now, the costing process was outside the realm of the industrial engineers at that time. I do not know if these companies are currently adding the costing to industrial engineers right now, or not. In comparison with private companies where I worked, the percent efficiency ran pretty close to the same.

So, there is some problem there, if we are getting a lot of extra cost. And in my personal opinion, I did not really see at that time that the problem was in the establishment of the standards.

Senator GRASSLEY. I would like to ask each of you—even though I am not finished with my questioning of Mr. Chauhan—do you think Government ought to allow a contractor's labor performance to be gauged against past performance, as opposed to labor standards?

Mr. **Hintze**. Sir, I think any management, whether it is in defense or whether it is a consumer product, should require their workers to work to a standard. They should be held accountable to a time standard. A well-engineered standard should be used to help set their goals.

Mr. **Adlfinger**. I have the same opinion as Mr. Hintze on that.

Senator **Grassley**. OK. Tell me why you believe that.

Mr. **Hintze**. When you have a well-engineered standard, as the gentleman on the preceding panel said, a standard is the time it should take a qualified worker or group of workers at a normal pace to accomplish a specified goal.

Now, most people, except new hires, are usually qualified, and the standard is not set so they cannot make it; it is just—if they are doing their job and management has given them the tools and training to do it correctly—there should be no reason why they cannot make standard. It must be well engineered. The standard is predicated upon the work content of the particular job. If the work content changes, then the standard changes to reflect that change.

So therefore, a standard time is a time that a normal, qualified worker should achieve. It is as simple as that, sir. If they cannot make it, then it is either management's fault for not giving them the tools or training, or they are not motivating their people.

Senator **Grassley**. A 3-to-1 realization factor is unacceptable, then?

Mr. **Hintze**. For direct labor, yes, sir.

Senator **Grassley**. Mr. Adlfinger?

Mr. **Adlfinger**. I did not hear one of your words. Was that "not acceptable" or "acceptable"?

Senator **Grassley**. Is not acceptable, or unacceptable, however you want to say it.

Mr. **Adlfinger**. There has been some discussion in the earlier panel about learning curves, and my answer would relate to the learning curve. Although I used to use the learning curve when I worked for some of the aerospace companies, and I also have been involved with it in the Government, I do not believe in learning curves. That is, I do not believe in applying learning curves, as a matter of course, to all Government contracts simply because we have always done so since World War II. I do believe that on new work there is some degree of learning possibly present. What I find is that the difference between the standard and the actual is a variance, and that occurs most often at the startup of manufacturing of the first few items, and it is related to a multiple number of things, such as not having all the tooling or even the proper equipment installed in the work area, whether they be workbenches or machines, or perhaps not having the facilities completed yet. So that until you get the skilled operators, and all of these other facets together, you have a wide variance possible from the standard. Once you have those things in place, then you can go out on the floor—and I have done this many times—with a stopwatch and actually time the people doing the work at the operation level, and you will find more often than not that they are in fact working at that standard.

Senator GRASSLEY. Mr. Chauhan?

Mr. CHAUHAN. Yes, Mr. Chairman. I think there is a choice. If you think you can do it, then you try, and you can do it. But if you convince yourself you cannot do it—and I think that is what the defense industry has convinced themselves of—then you cannot meet the standard, and it has come to be a tradition or a custom to accept that defeatist notion. It is going to take a lot of work to change or turn that thinking around. I gave you the example of the welfare people. Some of them, whom I observed before I came to work for the Department of Defenses, have convinced themselves they cannot work, and they literally became mentally disabled. And I think the same thing is happening in the defense industry. In the Defense Department, they have also convinced some of our people that they cannot meet the standards and every time they keep getting new contracts, and new business, and good profit. So I personally do not see that they really think or believe they can do it, because it has happened for the past so many years, and it has been accepted practice. We have to change that thinking. And if we can convince them that they can do it by telling them they have to do it, then I think they can make the standard.

Senator GRASSLEY. Are you saying that the variances between actual and standard are because of the pursuit of higher profits?

Mr. CHAUHAN. Would you restate that question?

Senator GRASSLEY. Are you saying that the variances between actual and standard are because of the pursuit of higher profits?

Mr. CHAUHAN. Yes, sir. The higher profit is a result, really. There is no incentive for a contractor to keep that variance low, because I have talked with the contractors, and when you ask them why they have this much variance between the standard and the actuals, they will tell you that they are operating within the budget. So there is plenty of money available, and their profit is based again on what they can spend. As long as they can keep getting that money, there is no incentive in the defense industry to bring that variance down.

Senator GRASSLEY. I would like to ask each of you—based upon your experience—what is your assessment of the efficiency of our defense factories—and if we further encourage the use of work measurement standards and techniques, do you think that we could significantly improve productivity?

Larry?

Mr. HINTZE. As the record shows, I am not that familiar with the defense industries, but I have gone into several defense contractor plants. One plant had no standards and another had no backup to their time standards. The contractors obviously were not working toward the standard since they had none. To have a meaningful efficiency, you must have good base data generated by good time standards. Since they had poor base data, whatever efficiency they reported would have been suspect. The work pace that I observed at the one plant that was operating was definitely below 100 percent.

Another anecdote concerning efficiency is about a corporation which had no standards. They did not seem to understand what standards were. When you have that type of situation, there is no way they could have had an efficiency that was very high.

Senator **Grassley**. Mr. Adlfinger?

Mr. **Adlfinger**. I have not been to all defense contractors. I have been in a few of them. I would say that my answer to that question is mixed, because I have seen good standards—and I have seen those—and where they have been managed and applied properly, I would say you would not get any improvement unless you improve the methods and then set new standards. In others, I would say yes, for example, one in particular did have good standards on paper, but when you looked at the people doing the work against those methods for which the standard was set, the people did not follow the procedures, the prescribed method. So therefore, the standards were no good, even though on paper they looked good.

If management in that organization would enforce or instruct people to perform their work in accordance to the methods, then, yes, we would get improvement in that area.

Senator **Grassley**. Mr. Chauhan.

Mr. **Chauhan**. Mr. Chairman, I say it definitely can be improved. As I said in my written statement, some of the contractors do what we call a system called "front loading" where, because the Defense Department buys these products on a lot basis, so the contractors hire a lot of people upfront in "Lot 1." and therefore, that becomes their base for producing Lot 2, and on. So they purposefully hire a lot more people than they really need, and of course, then, the efficiency is low. But if we expect them to price based on the standard, this thing will be quite visible to the negotiators, and I do not think they will go for that kind of variance.

So my answer to this is definitely yes, at least the efficiency of the overall industry could be doubled by use of proper labor standards, and of course, we do have to introduce some kind of incentive system with incentive to produce at lower costs than higher.

Mr. **Hintze**. Mr. Chairman, I would like to mention an anecdote that his comment brought to mind. Concerning the same contractor who had no standards, a top official was asked how they determined the proper manning of the production line. This official said that when they first started up, they hired everybody off the street. When they discovered that a worker had nothing to do, they would fire the person. That is how they finally determined the manning of their production line. Obviously, efficiency could have been improved using standards in determining staffing of the production line.

Senator **Grassley**. Mr. Adlfinger?

Mr. **Adlfinger**. Mr. Chairman, on that question, I would also like to add, from my own personal experience in the contractor plants, or even Government plants, where they did not have work measurement. By introducing then, disciplined methods, description, and enforcement, and a measurement, I would expect to have an increase in productivity, and efficiency.

Senator **Grassley**. Mr. Chauhan, you have been involved with work measurement and productivity studies at Raytheon, Boeing, Hughes. Can you share with us any conclusions or general comments from those studies that would shed light on the importance of examining work measurement standards?

Mr. **Chauhan**. Mr. Chairman, as I think I stated in my testimony before, at Hughes, the variance of the standards was about 17.2 to 1, and when I talked with one of the program managers, I said, "Doesn't this type of variance upset you sometimes—it is so bad?"

He said, "No. Look at this budget. I have the budget. I am operating under the budget." So he was really not worried about how much his variance to standards was.

They also had scrap and rework at, I think I remember, about 400 times the standard, and we asked them the same question, and the answer was, "Well, it is in a development stage, and we really had to do a lot of rework to make it work."

At the Raytheon Co., with some of the examples I have cited, they had a good work measurement system, and I concluded cost of labor per standard hour which, even though it appears to be high, seems to be the lowest one in the industry. There are other contractors who were much higher. And it also shows the trend, a decrease in the cost of labor per standard hour as they went into subsequent lots.

So I think it was an excellent tool for us to assess. That the proper management attention was being given to productivity in that plant, even though I think these numbers are still high, but if you compare them with other different contractors, they will not look so bad.

Senator **Grassley**. Mr. Adlfinger, in your experience with defense plants, have you ever witnessed examples where the quality of work was suffering due to the lack of emphasis upon prescribed labor standards?

Mr. **Adlfinger**. Yes, sir.

Senator **Grassley**. Could you give us a feel for what the situation was?

Mr. **Adlfinger**. Well, at one plant, I was called in approximately 2 years ago to look at and validate their standards, in which the company stated they had a certain percentage, a high percentage of coverage by type 1, or engineered time standards. In looking at the actual procedures that the workers used, in one case, an operator was working on a printed circuit board that was supposed to be static-free, or kept static-free at that point. It was in an enclosed envelope and should have been handled by workers with gloves on in order to keep static electricity from sparking into the components on the board or circuitry, and instead of that, they removed the board from the static-free envelope and did some assembly to it with just their bare hands, and then set it aside in a pile of other boards that they had done the same thing to. In that particular case, I do not know what would have been found with respect to influence on quality of those boards, but I would be very suspect that that would add to failures in the missiles at a later date.

Senator **Grassley**. Mr. Castle says that the commercial industry realization factors can be as high as 10 to 1. Do any of you know enough about the commercial sector to comment on that?

Mr. **Adlfinger**. Would you repeat that, please?

Senator **Grassley**. Well, Mr. Castle has spoken to the point that in commercial industry, realization factors can be a high as 10 to 1. If you have the background to comment on that, I would like to know about the commercial sector.

Mr. **Adlfinger**. In the commercial companies that I have worked, they did not use a so-called "realization factor." So, the only difference they would have would be what I would call a variance from standard. Companies where I have worked, like Deere and Co., concentrate on tryng to have incentive type of operations, and in those cases, they would be working very close to the standard, and they would be paying, of course, for people meeting those standards or exceeding those standards.

Mr. **Hintze**. Mr. Chairman, the companies I worked for, again, they did not call them realization factors. Again, both of them were looking at the incentive plan, and you were looking at direct employees only and their efficiency. The reciprocal would have been the realization factors. They all would have been very close to one, sir, the ones I am familiar with.

Senator **Grassley**. Is it possible, in your opinion, for industrial engineers employed by defense contractors to construct reasonable and accurate time standards for work to be done on new complex weapons systems?

Mr. **Hintze**. Yes, sir. In my job, I have had IE's from defense contractors in my classes. Several indicated that they would like to implement 1567A at their plant. However, the official response from those same defense contractors is the opposite to what their own IE's believe.

Senator **Grassley**. Mr. Adlfinger?

Mr. **Adlfinger**. I would say, yes, sir, that would be true, and also, in my experience, I think if we would really look into and perhaps audit some of these companies, we would find that they do have, in effect, standards in those areas that perhaps right now, we are led to believe they do not have.

Senator **Grassley**. Is it your assessment that the defense industry is less efficient than it should be, and if so, by how much?

Mr. **Adlfinger**. I could not hear exactly what you said, sir.

Senator **Grassley**. Is it your assessment that the defense industry is less efficient than it should be, and if you think it is less efficient, to what extent? Larry?

Mr. **Hintze**. From what I have seen the IE's at both Government and the contractor level could do a lot more if given the funds or at least given the go-ahead to start doing methods improvement and work measurement.

Yes, they can improve. Percentagewise, I have no idea what they could improve upon, sir. But I would say that it would definitely increase if they would start developing methods improvement and time standards instead of fighting us.

Senator **Grassley**. Well, would wider application of work measurement help?

Mr. **Hintze**. Sure.

Senator **Grassley**. Mr. Adlfinger, how inefficient or how less efficient do you think the defense industry is?

Mr. **Adlfinger**. Well, Mr. Chairman, it is pretty hard to answer without actually going in and doing a survey right now. Let's say approximately 20 years ago when I worked in most of those companies, when you talk about efficiency, you are talking about one thing. You are talking about the measurement of the standard earned hours against the actual work counts, the work that had those standards on it and the actual hours that the operators put in doing that work. And that ran, in some of the companies I worked at, around 80 percent or so in those days.

I do not know what they are running today, but from the one study that I mentioned earlier that I was called in on 2 years ago, I would say there was an awful lot of room for improvement. But it is not just in setting standards where you get the improvement. It is in using those standards. It is in using the total work measurement system.

Senator GRASSLEY. Mr. Chauhan?

Mr. CHAUHAN. Mr. Chairman, I want to comment on two things. One thing is this word, "complex" and "state-of-the-art weapons system"—I think this is a buzz-word being used by the defense industry, and they have some of our DOD people convinced that this is the way it is. I think if bungling up a system is called a complex system, of course we have a lot of complex systems. But I have not seen any complex operations in those plants which are more complex than the one they use for commercial production—I work at a plant where they produce both the military systems and the commercial systems.

Now, to answer the second portion of the question, I want to make another comment. This buzz-word "complex" is used routinely by the contractors to submit proposed cost. They use the same technique at the Boeing Co., and when they used complexity factor, I used to apply a simplicity factor. Every time they say the system is complex, I will look at it, and I find it to be 25 percent simpler than the previous one they were estimating the times based on, so they quit doing that. I think we have gotten them away from that. When they figured out that I was not going to buy their "complex system story," they have gotten away from using this term in their estimates.

But I think it is a misnomer, and it is not a fair statement that all the weapons systems are more complex than the systems they produce in commercial industry. I think the technology has to go hand-in-hand both in the private sector and in the military sector. In the private commercial world, they have to have state-of-the-art products to stay competitive. In the defense industry, they do not have to do that. They keep changing and changing and changing and reworking and working the same system they had before. So I do not think that makes it complex.

To answer your second question, whether there is an improvement, yes. I think with the proper controls and expectations, we ought to have those definite improvements hand-in-hand. We have to expect them to improve. We have to have proper controls, and their efficiency could at least be improved by 100 percent.

Senator GRASSLEY. Mr. Hintze and Mr. Adlfinger, I would like to ask whether the Army routinely used time standards for monitoring contract on work performance, and is this information readily available to the Army?

Mr. HINTZE. Sir, I have little knowledge of that. What you are asking for, I have no answer, sir.

Senator GRASSLEY. Mr. Adlfinger?

Mr. ADLFINGER. Mr. Chairman, I have knowledge in the Headquarters AMCCOM, where I work, not all of Army, and yes, we do have standards in the Government-owned, Government-operated plants. These would be readily available. It is not a practice to call up these standards, which are normally set at the operation level to use them; usually, they are only usable for the most part at that location, at that plant, unless it is at summary level to use in the costing process. We do require in our government-owned contractor-operated plants that are active plants—we do have a lot that are inactive, and a lot of plants that are active—a requirement, a regulation, ARRCOM Regulation 5-3, which does require them to have a work measurement system and to use it. I am not sure if we could get those standards, becasue it has not been a practice to do that, but I am sure that we would be able to go in and audit the standards.

Senator Grassley. I would like to have all three of you react to comments that I previously read, comments in which DOD made some commentary on the standard hour amendment.

I would like to read four of these and have one or all of you comment on them. Do you have these in front of you?

Mr. Adlfinger. Yes, Senator, we do.

Senator Grassley. Then I am not going to read them. But I would ask you to comment on 1, 2, 3, and 4, if you would.

Mr. Chauhan. May I comment on the first one, Mr. Chairman? It says there are many end items or components required for the different purposes for which there is no commercial market, and probably no commercially available standards. Standards are not applied to end items; they are applied to operations. So even if the end-items didn't have standards, we have standards for the operations.

Senator Grassley. Please elaborate on that.

Mr. Chauhan. OK. Even if the end item is different, and nobody else buys it, there are operations you have to accomplish to make that end item; let me give you an example. In the Boeing plant where I work, there are about 550 to 600 different operations or processes, like drilling, cutting, deburring—things like that—which you have to do to produce components of the system to make the system. Now, these operations or practices are not any different for the products which the Defense Department uses than for what the commercial market uses, so I disagree with this statement.

Mr. Adlfinger. Mr. Chairman, I would like to to say that it would be obvious to any industrial engineer that is trained and experienced in methods or standards that the person making such a statement here in No 1 was not too knowledgeable in work measurement. One of the great advantages of a predetermined time system is that it can applied to any type of work requiring manual motion.

Another great advantage is that these systems may also be applied to the determination of proper and standardized methods and achieve required quality specifications, along with the times required to do the work and prior to initiating the work on the product.

[Material submitted for the record:]

REQUESTED TESTIMONY

Comments by Mr. Albert C. Adlfinger on the four points from DOD memos as requested by the Chairman, Senator Charles E. Grassley, at conclusion of the Senate Subcommittee on Administrative Practice and Procedure hearing, 23 July 1985.

Point 1. There are many end items or components acquired for defense purposes for which there are no commercial markets and probably no commercially available predetermined time standard systems (e.g. air-to-air missiles, submarines, tanks). The nation's defense strategy for qualitative superiority and state-of-the-art weapon systems places a premium on technological change, and this would also raise doubt on the commercial availability of predetermined standards.

Comment 1. It would be obvious to an Industrial Engineer trained and experienced in Methods and Standards that the person making such a statement was not too knowledgeable in work measurement.

One of the great advantages of a predetermined time system is that it can be applied to any type of work requiring manual motions. Another great advantage is that these systems may also be applied in the determination of proper and standardized methods, to achieve required quality specifications, along with the time required to do the work, prior to initiating work on the product.

No change in product technology or design affects the availability of predetermined time systems.

Point 2. Where there are no commercial markets and accompanying standards, there is no method provided in the Grassley standard-hour amendment to take into account qualitative differences between commercial and military specifications (e.g. survivability, maintainability, security).

Comment 2. Qualitative differences between any specifications whether they be commercial or military are accounted for in establishing valid time standards, especially the engineered type of time standard which is most often generated through commercially available predetermined time systems or time studies.

The examples of "survivability, maintainability, and security" are normally considered to affect the design of the product and are not criteria for precluding any of the commercially available time systems from being applied to them.

Point 3. No method in the amendment to take into account differences in acquisition and manufacturing processes between commercial markets and the defense industry (e.g. product volume, manufacturing tolerances).

Comment 3. Any different manufacturing processes required for different products will be taken into consideration and will be accounted for in the establishment of good quality work measurement time standards.

Point 4. With DOD's emphasis on contractor capital investment in new facilities and equipment to improve efficiency (e.g. robotics), the application of engineering labor standards may have become less reliable.

Comment 4. The emphasis on capital investments in new facilities and equipment does not in any way affect the reliability of engineered (time) labor standards.

Even with the use of robots, there still remains the need to know how long it takes to perform each operation of work, therefore, some form of work measurement is still required.

Mr. HINTZE. I have to agree with Mr. Adlfinger concerning the person who made that first comment about the predetermined time system not available for the item. You measure the method of the worker, not the item they are making. So if you are measuring the method, it is immaterial what the product is. The output is insignificant.

As Mr. Adlfinger said, this comment must have been made by someone who is not very familiar with the predetermined time system.

Senator GRASSLEY. We just had a vote called, and since you are the last panel, I would ask you to respond to those points in writing, if you would, please. I would appreciate it very much as a matter of expediency. If I go over there to vote now, we are going to kill well over a half-hour because there are back-to-back votes. I do not think there is any point in holding up you folks who have yet to testify.

I thank this panel. But I also want to thank each of our witnesses for testifying, in particular, those who had to come in from out of town. I think your testimony has enlightened the Congress and the public on an issue which is little understood, but an issue which is growing in importance. There are probably a lot of conclusions that could be drawn, but I'll draw just one conclusion from today's testimony on the subject of work measurement standards. We have the picture from you folks, both panels, which is different from that portrayed by the Department of Defense. Time standards are applicable to the defense industry, and they may show a level of inefficiency contrary to what we have been told by the Defense Department.

Our hearings will continue tomorrow, and I thank each of you. This meeting is adjourned.

[Whereupon, at 4 p.m., the subcommittee was adjourned.]

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AGENCY FLOW OF INFORMATION

WEDNESDAY, JULY 24, 1985

U.S. SENATE,
SUBCOMMITTEE ON ADMINISTRATIVE
PRACTICE AND PROCEDURE,
COMMITTEE ON THE JUDICIARY,
Washington, DC.

The subcommittee met at 9:35 a.m., in room SD-562, Dirksen Senate Office Building, Hon. Charles E. Grassley (chairman of the subcommittee) presiding.

Also present: Senator Specter.

Staff present: Kris Kolesnik.

OPENING STATEMENT OF HON. CHARLES E. GRASSLEY, A U.S. SENATOR FROM THE STATE OF IOWA

Senator GRASSLEY. I call the hearing of the Subcommittee on Administrative Practice and Procedure of the Senate Judiciary Committee to order.

This is the final day of hearings in this short series dealing with the flow of agency information. Yesterday, the subcommittee received testimony from two panels about the relevance and application of work measurement data within the defense industry.

I believe the testimony was fair and balanced in that views were expressed from both the industry and Government. These engineers were charged with monitoring the industry's efficiency. While the witnesses did not agree on every issue, they generally agreed on the following:

Work measurement indeed is an important and integral part of defense industry planning, scheduling and budgeting.

Time standards should be more widely used than they are, and they should be given more attention by the Defense Department.

All but one industry witness agreed there is general inefficiency in the defense industry, and much room for improvement. Work measurement is a valuable tool for increasing efficiency.

More analysis of contract performance is justified.

Now, beyond those conclusions, while the witnesses were in general agreement on these points, it appears that the Defense Department, or at least the Office of the Secretary of Defense, has a unique viewpoint of work measurement. That viewpoint does not seem to be supported by anyone else in the area of industrial engineering.

The Office of Acquisition Management is firmly on the record as opposing and contradicting the generally held principles of DOD's own industrial engineers regarding the value and the need for work measurement.

Yesterday's hearings gave us an abstract debate on work measurement, and then testimony from three industrial engineers from the military services. Those engineers were in agreement that work measurement time standards can be met in the defense industry, yet are not often being met. There was also agreement that an unacceptable level of inefficiency exists. That assessment came from those in the field who monitor and oversee defense factory work. These observations, however, differ sharply from what we have heard from OSD's Office of Acquisition Management.

Today we will look at how the services are implementing work measurement, and what role OSD has played in encouraging or discouraging its application.

We have four witnesses scheduled for today. The first two, appearing as panel, will be Charles Hooper, director of manufacturing, Air Force Systems Command, and Pat Haugh, chief of industrial engineering for the Panadent Corp.

We call those witnesses at this point. I would like each of the first two—is Mr. Haugh here?

Yes, sir. Thank you.

I would like each of you to describe your background and direct work experience in manufacturing, either from the educational point or view and/or actual hands on work experience. Please proceed in the manner in which I introduced you. So, Mr. Hooper, you are first.

STATEMENTS OF PANEL CONSISTING OF CHARLES HOOPER, DIRECTOR OF MANUFACTURING, AIR FORCE SYSTEMS COMMAND, U.S. AIR FORCE; AND PATRICK HAUGH, CHIEF OF INDUSTRIAL ENGINEERING, PANADENT CORP., CALIFORNIA

Mr. **Hooper**. Thank you, Mr. Chairman.

My name is Charles Hooper, currently director of manufacturing, Air Force Systems Command.

Educationally, I have a bachelor of science degree in electrical engineering from Vanderbilt University. Took my graduate work at the University of Tennessee. I have 10 years experience working in the defense industry, 4 years as a private consultant, 9 years working in the Air Force manufacturing community.

If I may, I would like to read a summary of my testimony and then submit the written testimony for the record.

As headquarters, Air Force Systems Command director of manufacturing, I am responsible for Air Force Systems Command policies designed to encourage improved manufacturing effectiveness in our defense contractors. Work measurement, primarily as embodied in military standard 1567A, is one of the many tools available to achieve this objective.

In AFSC we are committed in requiring our contractors to develop discipline, work measurement systems, to improve productivity and reduce costs. We are also committed to using the work measurement data to help manage our system acquisition. I want to emphasize we are not trying to force the operator to work harder. We are primarily interested in making management work smarter.

The operator has only a small portion of responsibility here. The bulk of the problems are management problems, and that is the area we are trying to attack.

I have prepared a briefing chart, which is attachment 3, in my formal testimony which summarizes what we believe are the key ingredients required for a good work measurement system.

Please note that good labor time standards are only part of this picture. What is done with these standards is really more important. Particularly we must measure out performance progress, try to improve that performance, and also try to eliminate as much labor as possible through methods improvements on the task itself.

We must adjust the labor standards to establish a new baseline as methods change. And, finally, we must use the visibility we have gained to price and negotiate contracts.

Attachment 4 of my prepared testimony shows how the elements which make up the variance vary over time, and also why performance to standard is so hard to achieve.

Performance to standard requires the following crucial elements:

Elimination of scrap, rework and repair and the reinspection; complete rate tooling availability, stabilized processes with no design tooling or method of changes, no machine downtime, manpower perfectly matched to schedule requirements; no parts material shortage problems; employees totally familar with all aspects of the job; and work performed consistently under stable conditions.

Very frankly, these requirements are almost impossible to achieve, they are extremely complex, constantly changed limited production rate systems that we acquire.

This chart also underscores the fatal flaw in those philosophical arguments which assert that the labor time standard is not dependent on mature production, and that standard performance should be immediately expected. This assertion is simply without substance in the real world. We cannot and do not report these individual operator or process level performances to Congress.

The contractor does not set a single time standard for the B-1, for example, but rather literally thousands of individual labor time standards.

Work measurement applied to major systems is clearly a situation where the whole is greater than the sum of the parts. The operator can be held responsible for only a portion of the total realization factor described in this chart. His responsibility is limited primarily to learning and that portion of rework scrap, repair, and reinspection caused by operator error.

Rework, scrap, repair, and reinspection costs by such things as engineering changes or vendor problems and all the rest of the technical and logistic realization factor elements are the responsibility of management.

The labor time standard does not and cannot take these other factors into account. It is these problem areas which cause those extra hours which make the whole greater than the sum of its parts. And it is this total performance level that has been reported to Congress and publicized in the media.

These management problems are present in every product being built. They are particularly prevalent in DOD systems for two reasons:

First, because of the need to fill a system quickly. To counter very real foreign threat, systems must often begin the production process before all development problems have been found and corrected. We must literally learn in the broadest context of the word during production.

Second, the foreign threat is not static. The enemy is constantly upgrading the capability of his systems as well. Since our ability to defend this country as predicated on technological, not numerical superiority, we must incorporate and prove capabilities into our system even as they are being produced. This causes unavoidable perturbations in the manufacturing process which impact our ability to produce the standard.

Let us look now at a real live example of how these theories translate into practice.

Attachment 2 of my testimony describes a relatively stable, relatively large volume Air Force system overtime.

Rigorous type I, or engineering labor standards, were not begun to be developed until production had started after the manufacturing process to stabilize.

It is important to take note of all the changes to the design and/or processes overtime. They include tooling improvements, technology modernization, engineering changes, methods improvements, rate changes, and finally a major model change. All of these changes impact mature production of standard performance achievement.

Attachment 5 to the testimony explains why in the real world we cannot limit our attention to performance standards. This is another relatively stable, relatively high volume Air Force program. The chart graphically indicates why we are concerned with more than just efficiency. Methods improvements is also significant.

During the first quarter of fiscal year 1983, the performance, the standard for this program was 1.63. It was reduced to 1.24 by the end of the first quarter of fiscal year 1984. And by the first quarter in fiscal year 1985, it was back to 1.47.

Was the contractor's performance really deteriorating? The answer is no, because the actual manufacturing hours had declined from 948 during the first quarter to 879 during the first quarter of 1985. Therefore, the cost to the Government was actually less.

The reason for this reduction in cost was that a significant attempt was made to improve the manufacturing methods rather than focus totally on production efficiency. We want to encourage, not discourage, this kind of performance effort.

Finally, I would like to summarize preliminary data from a survey we are conducting on non-DOD work measurement performance.

First of all, I would like to reaffirm that although most aerospace companies assume they will achieve standard performance at unit 1,000, there is no magic number when the standard should be achieved. Mature production is the key to achieving standard performance, and that is driven primarily by a stability in the production area.

Second, not even well-run commercial companies expect to achieve standard immediately. Even when their tasks are much less complex than ours.

A well-known manufacturer of trucks in the United States estimated they will achieve standard performance at unit 3,900. Their unit No. 1 performance is approximately 6. That is, they are about 17 percent efficient.

Their mature production, they normally achieve about 82-percent efficiency, and the standard hour content of these trucks is only 11½ hours. By contrast, the standard hour content of the B-1 bomber at Rockwell Engines and Avionics is approximately 235,000 hours.

A well-known tractor manufacturer standard is assumed to be achieved within 5 to 6 weeks; that is, it is independent of the number of units produced. Their unit No. 1 performance index is approximately 1.6. That is about 63-percent efficiency.

During mature production, shop performance approaches 100-percent efficiency. This company is an incentive shop. Most commercial and defense companies are not. The labor standard hour content of these contractors is 1,000 hours.

A well-known U.S. manufacturer of consumer and industrial tools estimate they achieve standard by approximately unit 4,000. Their standard performance index for the first 100-unit production lot is approximately 1.3, 77-percent efficiency. They also achieve standard performance during mature production, but the standard hour content of these tools varies from 1 to 3 hours.

A well-known manufacturer of small aircraft has assumed standard would be achieved at unit 200 for their latest products. But they now do not anticipate that they will make it. Their unit No. 1 performance index was approximately 3.1 which translates to only 32-percent efficiency. Their unit No. 90 performance index is approximately 1.8 or 55-percent efficiency.

The standard R content of these planes is about 16,000 hours.

If a commercial company reports 100-percent efficiency, does that mean there are no unproductive labor hours? It could mean that or it could not. Did the company include any unusual allowances in the standards? Did the company account for machine downtime, meetings with the supervisor, treatment by the nurse, and some other account from the work measurement system? We do not know without detailed analysis.

This points up to difficulty in reaching conclusions from raw work measurement data.

This concludes my summary. I will be happy to answer any questions.

[Statement follows:]

PREPARED STATEMENT OF CHARLES HOOPER

MR. CHAIRMAN, MEMBERS OF THE SUBCOMMITTEE:

THANK YOU FOR INVITING ME TO PARTICIPATE IN THESE HEARINGS. THE IMPLEMENTATION OF EFFECTIVE WORK MEASUREMENT SYSTEMS WITHIN THE DEFENSE INDUSTRY IS OF GREAT INTEREST AND IMPORTANCE TO ME--AND ALSO TO AIR FORCE SYSTEMS COMMAND.

AS HEADQUARTERS, AIR FORCE SYSTEMS COMMAND DIRECTOR OF MANUFACTURING, I AM RESPONSIBLE FOR AIR FORCE SYSTEMS COMMAND POLICIES DESIGNED TO ENCOURAGE IMPROVED MANUFACTURING EFFECTIVENESS IN OUR DEFENSE CONTRACTORS. WORK MEASUREMENT, PRIMARILY AS EMBODIED IN MILITARY STANDARD 1567A, IS ONE OF MANY TOOLS AVAILABLE TO ACHIEVE THIS OBJECTIVE.

AIR FORCE SYSTEMS COMMAND
AND
WORK MEASUREMENT

BACKGROUND.

Military Standard 1567A (MIL-STD-1567A), Work Measurement, is a tool used by the Air Force Systems Command to reduce costs and increase productivity. However, it is not a panacea which will automatically cut the defense budget in half. Application of MIL-STD-1567A ensures that contractors continuously monitor--and seek to improve--direct manufacturing labor performance. Typically in-house direct manufacturing labor represents 10-20 percent of total program costs. In Air Force Systems Command, roughly 15 percent of our program costs are due to prime contractor direct manufacturing labor (Atch 1). Application of MIL-STD-1567A also ensures the government is provided visibility into contractor performance. A 1980 study by the General Accounting Office noted that an aggressive, effective work measurement system such as that embodied in MIL-STD-1567A could increase direct manufacturing labor productivity in contractor plants by 10 to 30 percent, resulting in an overall five percent reduction in major weapon system acquisition costs.

An overall five percent reduction may not be realistic. Most Air Force Systems Command contractors already have functioning work measurement systems. However, Air Force Systems Command is not convinced that these systems are as effective as they could be. Certainly, we believe significant improvement is possible. Consequently, Air Force Systems Command is emphasizing widespread, consistent contractual application of MIL-STD-1567A on all major system acquisitions. Requirements to develop and implement a work measurement system are included in almost 70 percent of our major system contracts. The Air Force has far more real-world experience with work measurement than the other Services combined. More importantly, however, Air Force Systems Command is determined to use work measurement data in contract pricing, negotiation and management.

Specifically, Air Force Systems Command has committed to:

1. Use work measurement information in a "should cost" approach to price and negotiate contracts. This means that "actual" system costs from earlier system acquisitions will not be accepted as a basis for pricing and negotiating future acquisitions without careful scrutiny. The impact of any previous unacceptable contractor performance, unusual circumstances, and anticipated production improvements will be identified, quantified and considered.

2. Require contractors to reduce the manufacturing labor content of weapon systems by improving manufacturing techniques, processes, and equipment.

3. Require contractors to improve manufacturing labor efficiency.

4. Use work measurement information to objectively measure and evaluate contractor manfacturing performance.

PRINCIPLES OF WORK MEASUREMENT.

The foundation of a work measurement system is the labor time standard. The labor time standard is established by contractor industrial engineers. It represents the time a particular task "should take" a trained worker during mature production. That is, the contractor industrial engineer who establishes the labor time standard does not expect actual performance to equal the labor time standard until mature production. Mature production is that point during a program's production cycle when "start-up" problems have been eliminated--when all the required manufacturing processes and equipment are functioning smoothly. Most frequently, mature production is considered to be reached at production unit number 1000. However, significant changes in the product (for example, engineering/configuration changes) resulting in changes in manufacturing methods, significant "breaks" in the production schedule, or a significant increase in new employees, may delay "mature production" considerably beyond unit 1000. Most defense systems, because of their relatively low production volume and frequent design improvements, never reach "mature" production (as defined by the industrial engineer when establishing the labor time standard). (See Atch 2 for an example of a typical program cycle.)

There are six elements which are considered when a labor time standard is developed:

1. Training of the worker. The worker is assumed to be adequately trained.

2. Pace of the worker. The worker is assumed to be performing at a "normal" pace.

3. Unit of work. The task to be accomplished (for example, fasten part "A" to part "B") is completely described.

4. Specific manufacturing method. Labor time standards are totally dependent on the particular method chosen. Therefore, the specific method to be used must be completely understood and described. If the method changes, the labor time standard also changes. (Additionally, two companies may make an identical component. But if their "methods" are not identical, the labor time standards associated with producing the components will be completely different.)

5. Specific working conditions. Changes in the working conditions (for example, from a well-lighted, air conditioned factory to outside in heat and humidity) will impact the labor time standard.

6. Acceptable quality. The work is assumed to result in a product of acceptable quality. No rework or repair is considered.

By comparing the labor time standard with the "actual hours" expended to complete the task in question, the contractor (and the government) can:

1. Gain visibility into labor inefficiencies at the level at which the problems occur.

2. Use the labor time standard as the ultimate (mature production) performance objective.

3. Evaluate alternate manufacturing methods by comparing the labor time standards required to complete a task using one method with those required using an alternate method.

4. Gain pricing/negotiating insight by using performance against labor time standards as a tool to quantify past performance and forecast future improvements.

A good work measurement system should meet ten basic criteria (Atch 3). It should:

1. Establish the most cost-effective manufacturing method to complete a particular task.

2. Set sufficiently precise labor time standards to provide a sound foundation from which to measure and improve manufacturing labor performance. These labor standards do not--and should not--include an allowance for "learning" during early production (in effect, an adjustment factor for immature production). It is important to measure performance against an "absolute," rigorously defined labor standard. To do otherwise would mask the total performance improvement potential.

3. Apply these labor time standards to at least 80 percent of the direct manufacturing labor hours necessary to build a particular product. (Additional coverage of direct manufacturing labor hours may not be appropriate since the remaining tasks could be sufficiently complex and non-repetitive to preclude spending the funds associated with developing precise labor time standards.)

4. Measure the actual hours expended and compare them to the labor time standards.

5. Analyze the difference between the actual time and the "standard" time. This difference is the "variance to standard" and is often termed "inefficiency."

6. Set aggressive performance improvement goals with "standard" as the ultimate objective.

7. Take appropriate corrective action to reduce variance and meet performance improvement goals.

8. Establish an effective "methods improvement" program to improve operations and reduce the labor content (the labor time standards) of individual manufacturing processes.

9. Maintain the labor time standard as the manufacturing method changes over time.

10. Use labor time standard data (in effect, the relationships between "actual" and "standard" hours) to budget, plan, schedule, and estimate manufacturing requirements.

WORK MEASUREMENT DATA PROVIDED TO CONGRESS.

Air Force Systems Command is not satisfied with the performance of its contractors, and has taken steps to require them to increase productivity and reduce costs. The first step leading to improved manufacturing labor performance is to gain visibility into current contractor performance. Because Air Force Systems Command had already taken this first step (by contractually applying, and enforcing the provisions of, MIL-STD-1567A), it was able to respond to the Congressional request for work measurement information. However, the data provided to Congress should be considered with extreme caution. Basically, the data provides "actual" hours and "standard" hours, by quarter, associated with in-house contractor direct manufacturing labor. It does not include engineering, other support labor, and/or other fixed "overhead" costs such as property and capital equipment. It includes only selected prime contractor manufacturing labor costs. For example, the B-1B data includes only that manufacturing labor associated with Rockwell's North American Aircraft Operations. It did not include other major B-1B program "prime" contractors such as General Electric Aircraft Engine Business Group, Boeing Military Airplane Company, or Eaton/AIL Corporation. Neither did it include any of the literally hundreds of subcontractors necessary to produce the B-1B bomber. It would not be feasible to even attempt to collect such information for all associate contractors or subcontractors.

Aside from the sheer magnitude of such an effort, the data collected would not present a consistent picture from which separate contractors could be compared. The techniques and definitions by which labor time standards are established can vary significantly. Accuracy requirements of labor time standards can vary from within ±10 percent, to within ±25 percent, to "estimated" standards for which there are no accuracy requirements. Additionally, some contractors include in their "standard" some provision for inefficiency and use that "adjusted standard" as their baseline from which to measure performance. Some contractors inlcude "set-up" (planned work necessary to get ready to perform a task) as "variance" or "inefficiency." Others include set-up in the labor time standard. For the small lot sizes typical in the defense industry, set-up labor hours can be substantial. Contractual application and enforcement of MIL-STD-1567A, Work Measurement, can eliminate some, but not all, of these differences. MIL-STD-1567A provides broad criteria which the contractor's work measurement system should meet. It does not eliminate all differences in work measurement systems.

Another factor requiring caution when attempting to evaluate contractor performance is the "phase" of the program. During program development, design and manufacturing instabilities are common. Due to their relatively high cost, precise "engineered" labor time standards are generally not even established until manufacturing methods and processes have been stabilized. "Estimated" standards are usually used during development. The purpose of development is to identify and fix problems--to get ready for production. Design requirements often dictate changes in manufacturing processes. These processes are continually evaluated and refined while the contractor attempts to learn how to build an extremely complex, state-of-the-art weapon system which has never been built before. Inefficiency is, unfortunately, an unavoidable by-product. Even after transitioning to production, inefficiencies remain because of the complexity of the manufacturing process. See Atch 4 for a summary of those factors which hinder achievement of standard--and how the significance of those factors vaires over time.

During development and production, the contractor is expected to make significant, steady progress to drive actual manufacturing labor performance toward the labor time standard. However, weapon system performance is continuously reviewed and improved as technology, or an identified foreign threat, changes. These changes often require manufacturing process changes which then must be developed and refined. This serves to delay achievement of true "mature" production. Weapon systems in development or early production cannot be expected to be produced as efficiently as those in mature production. These program differences, as well as those differences (described earlier) in the labor time standards themselves, make comparison of separate contractors, or even comparison of separate programs within the same contractor facility, extremely difficult.

There is another factor which makes comparison of "actual" to "standard" hours risky. That factor is the impact of manufacturing "methods" improvements. An example of this concept was included in the program data provided previously to Congress. Early in the production cycle of a particular program (Atch 5) (approximately the first quarter FY 83), the ratio of "actual" to "standard" hours was 1.63. This "performance index" was reduced to 1.24 by the end of the first quarter of FY 84. By the first quarter of FY 85, the performance index had increased to 1.47. One might conclude from this data that program performance was degraded and the Air Force should take action against the contractor. This conclusion would not be correct. Although the performance index may have increased between the end of the first quarter of FY 84 and the first quarter of FY 85, the "actual" manufacturing hours required to produce a unit had declined from 948 to 839. Despite a higher performance index, the cost to the government was less. The contractor had undertaken an aggressive program to drive manufacturing hours out of production processes by developing and implementing better, more effective manufacturing methods ("methods improvements"). If the Air Force had required the contractor only to drive down performance index, there would have been little or no emphasis on methods improvement. The Air Force would have a very efficient, but not necessarily effective, contractor.

COMPARING THE PERFORMANCE OF DEFENSE AND COMMERCIAL CONTRACTORS.

Comparing defense and commercial contractors is extremely difficult and should be approached with the utmost caution. Generally, techniques to develop labor time standards are consistent, regardless of industry.

However, the defense industry can be characterized as one of limited production volume, and extremely complex, state-of-the-art equipment and systems which are produced nowhere else in the world. This complexity means that the "cycle times" (aggregates of individual labor time standards required to complete specific tasks) for processes common to defense systems are extremely long, often as much as 20-30 hours. This is especially true in final assembly where some operations exceed 80 hours.

Most commercial businesses which apply labor standards are high volume producers of relatively simple equipment. Process cycle times generally range from seconds to minutes. These extremely repetitive, short cycle operations are inherently more efficient than less repetitive, long cycle operations. Long cycle operations contain more elements (which added together equal the "operation") to be sequentially performed. More work elements mean higher error potential. There is considerable unavoidable delay to recheck instructions, repeat steps performed, and determine the specific method to be used in intermediate process steps.

It's also necessary to consider another complicating factor--the difference between "operator" efficiency and "shop" efficiency. Operator efficiency considers only those activities for which the operator is accountable. The operator is normally not responsible for "unmeasured" work (work without labor standards). The operator is also not normally responsible for "idle" time due to delays awaiting parts, materials, or inspection; or for machine downtime. Finally, the operator is not normally responsible for rework, repair, or scrap due to engineering changes or vendor problems. Management, however, is responsible. Therefore, AFSC contractor performance data includes all of these other hours ("shop" efficiency). Much of the data available from commercial companies does not normally include these other "inefficiencies." Therefore, when comparing data we need to be careful that the data is truly comparable.

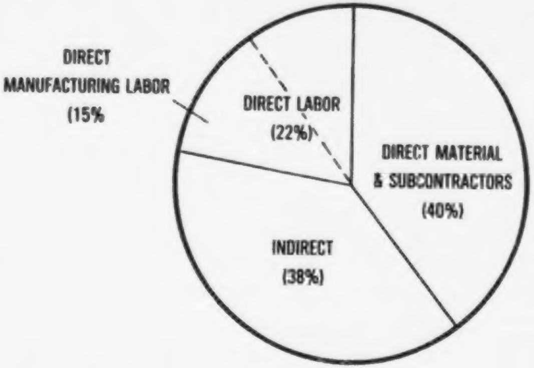
Finally, even well-respected U. S. commercial companies experience performance inefficiencies when transitioning from development to production. Even high volume producers of relatively simple equipment do not usually meet standard during development or early production. They experience many of the same problems defense companies have when transitioning new products into production. The commercial company usually improves more rapidly over a particular period of time. However, this is primarily because their large volume allows them to reach mature production very quickly.

SUMMARY

Work measurement indicators represent an excellent management tool to monitor, evaluate, and improve manufacturing labor performance. However, they should be evaluated only with a thorough knowledge and understanding of the subtle differences in individual contractor work measurement systems, and of the potential impact of factors such as production phase, complexity, stability, and methods improvement. Generally, this knowledge and understanding is present only in those individuals with on-going, detailed visibility into contractor manufacturing operations. Air Force Systems Command program managers and plant representatives have this detailed knowledge and understanding.

5 Atch
1. Program Costs
2. Manufacturing Hours
3. AFSC Criteria for a Good Work
Work Measurement System
4. When Should Standard Performance
Be Achieved? (Realization Factor
Elements)
5. Performance to Standard Not
Whole Story

PROGRAM COSTS



- FY85 DOD PROGRAM DOLLARS	$97 B
- DIRECT LABOR - PERCENT OF INDIRECT LABOR - SUBCONTRACTOR LABOR	} $33 B

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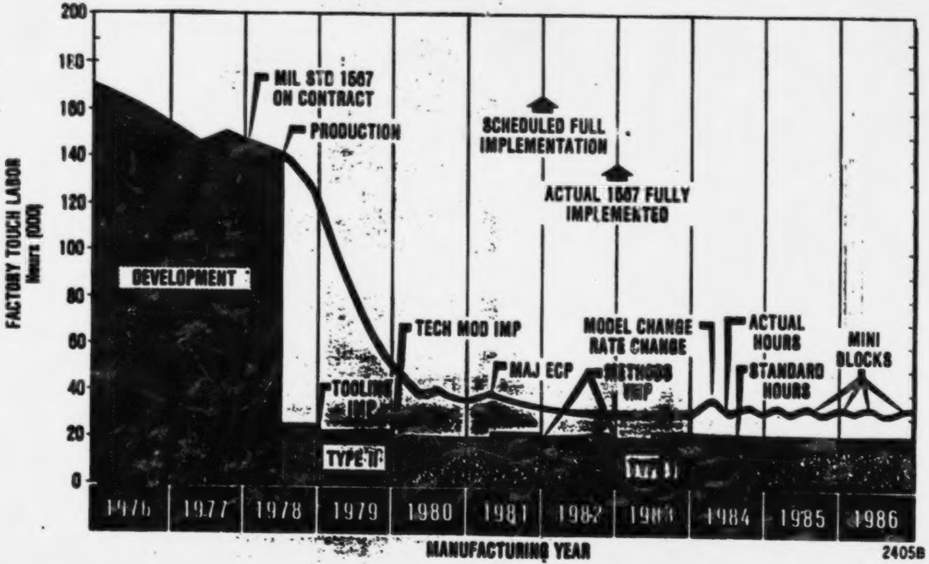
MANUFACTURING HOURS

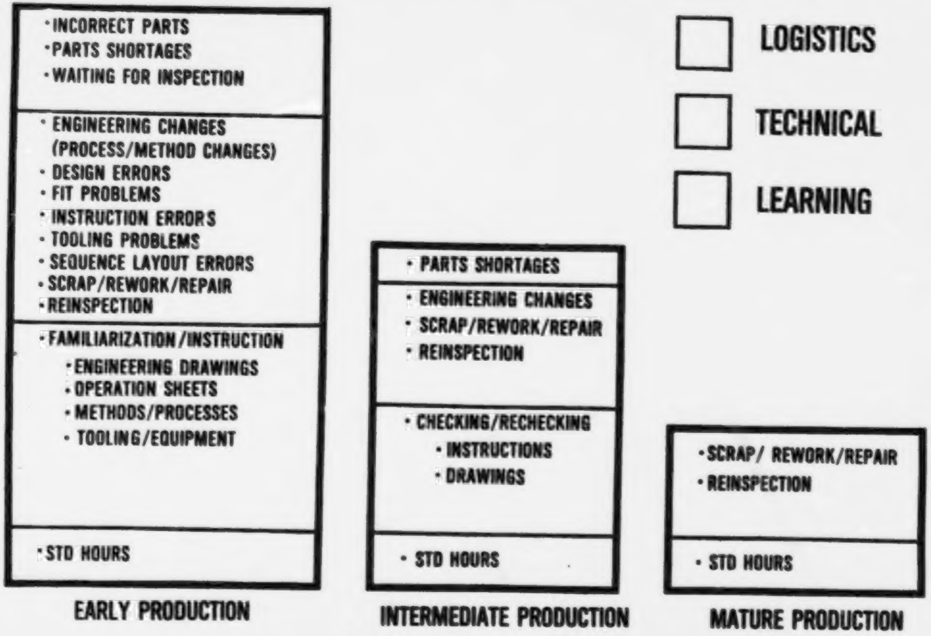
ACTUAL/STANDARD



AFSC CRITERIA FOR A GOOD WORK MEASUREMENT SYSTEM

- ESTABLISH BEST POSSIBLE MANUFACTURING METHOD
- SET GOOD STANDARDS TO METHOD
- PROVIDE AT LEAST 80% TYPE I COVERAGE OF TOUCH LABOR
- MEASURE ACTUAL TIME - COMPARE TO STANDARD
- ANALYZE VARIANCE TO STANDARD
- ESTABLISH PERFORMANCE IMPROVEMENT GOALS
- TAKE CORRECTIVE ACTION
- IMPROVE METHODS - SET GOAL FOR REDUCING STANDARD HOUR CONTENT
- MAINTAIN STANDARDS TO CURRENT METHOD
- USE STANDARDS FOR ESTIMATING

WHEN SHOULD STANDARD PERFORMANCE BE ACHIEVED (REALIZATION FACTOR ELEMENTS)



☐ LOGISTICS

☐ TECHNICAL

☐ LEARNING

EARLY PRODUCTION

- INCORRECT PARTS
- PARTS SHORTAGES
- WAITING FOR INSPECTION

- ENGINEERING CHANGES (PROCESS/METHOD CHANGES)
- DESIGN ERRORS
- FIT PROBLEMS
- INSTRUCTION ERRORS
- TOOLING PROBLEMS
- SEQUENCE LAYOUT ERRORS
- SCRAP/REWORK/REPAIR
- REINSPECTION

- FAMILIARIZATION/INSTRUCTION
  - ENGINEERING DRAWINGS
  - OPERATION SHEETS
  - METHODS/PROCESSES
  - TOOLING/EQUIPMENT

- STD HOURS

INTERMEDIATE PRODUCTION

- PARTS SHORTAGES

- ENGINEERING CHANGES
- SCRAP/REWORK/REPAIR
- REINSPECTION

- CHECKING/RECHECKING
  - INSTRUCTIONS
  - DRAWINGS

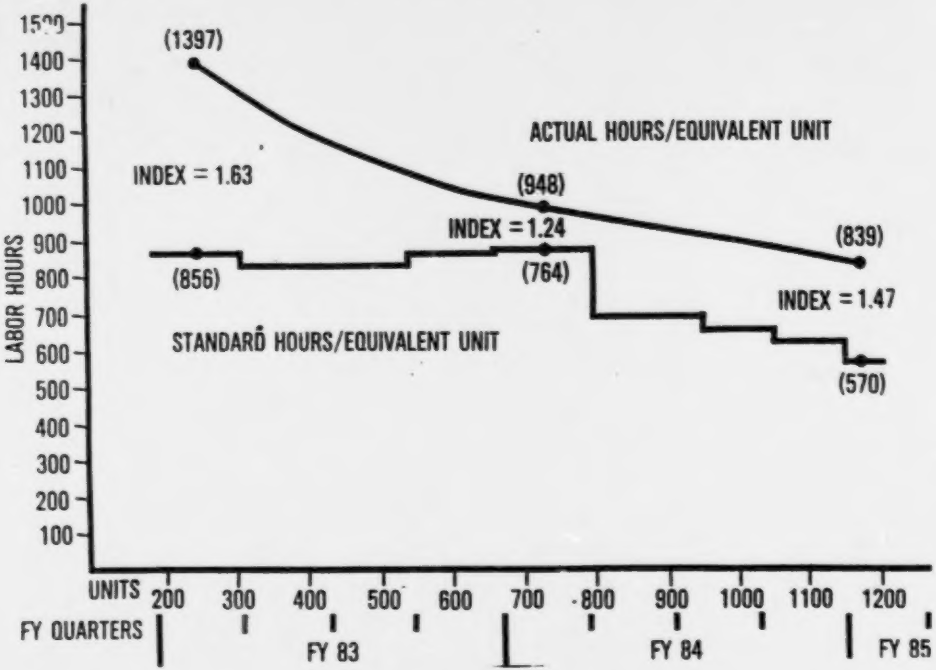
- STD HOURS

MATURE PRODUCTION

- SCRAP/ REWORK/REPAIR
- REINSPECTION

- STD HOURS

PERFORMANCE TO STANDARD NOT WHOLE STORY!



Senator GRASSLEY. Mr. Hooper, thank you very much. But before I ask you questions, we will hear from Mr. Haugh.

Mr. HAUGH. Mr. Chairman, I would first like to take the opportunity to thank the Chair and the committee for offering me an opportunity to participate in discussing what I consider to be the most important defense procurement legislation considered by the Congress over the past 30 years.

Second, I would like to apologize for the brevity of my proposed testimony, which is as follows. I understood I was to keep it brief, and brief I did.

Senator GRASSLEY. Yes. Let me clarify. If there was a longer statement that you want to make, as in the case of Mr. Hooper where he summarized, you can present a prepared text of reasonable but much longer length. If you want to insert it in the record, you can do that.

Mr. HAUGH. Yes, I understand that and I intend to do that.

Senator GRASSLEY. Thank you.

Mr. HAUGH. My name is Patrick Haugh. I am currently chief of industrial engineering with the Panadent Corp. in Grand Terrace, CA. I am a senior member of the Society of Manufacturing Engineers and a registered professional engineer. At the time of my retirement from civil service, I was Chief of the Manufacturing Plans and Programs Office, Air Force Contract Management Division at Albuquerque. My direct association with the aircraft, missile and electronic industries spans a period of over 40 years.

During the course of my employment with the Government and private industry, I have had many opportunities to develop, implement and evaluate labor standard programs in many commodity areas. For example, aircraft, engines, both jets and reciprocating, missile, reentry and electronic systems.

While with the Air Force, I participated in manufacturing management surveys and should cost reviews at over 20 major contractor and subcontractor plants. During the course of these reviews, it was my policy to completely review the contractors' procedures for the development and utilization of direct touch labor standards.

I feel strongly that my manufacturing management experience, coupled with over 8 years previous experience as an aircraft mechanic, make me uniquely qualified to judge the appropriateness and relevance of utilizing labor standards in the defense acquisition environment.

Considering my past experience, it should come as no surprise that I am compeletely shocked, annoyed and dismayed when I read the comments of the uninitiated among us, including some industrial engineers, who not only question the appropriateness in the use of labor standards and performance measurement in defense contracting, but also question their relevance in a manufacturing environment.

It would seem to me that even the most obtuse member of the industrial engineering profession must certainly realize that the successful development and implementation of a production plan must have its roots in a disciplined labor standards program.

This being a "given," could it be then that those who oppose labor standards and performance measurement are not really questioning the relevance of standards to defense contracting, but rather the use of standards in measuring the ability of management to manage, which is really what peformance measurement is ultimately all about.

Thank you.

Senator **Grassley**. Thank you very much. I appreciate your testimony and your succinctness.

I do have questions for specific witnesses, but I would not want to preclude other people from responding to a question that is directed toward another person.

Mr. Hooper, in your experience and training, have you had actual hands-on experience of work measurement in factories? And I would also ask that of you, Mr. Haugh.

Mr. **Hooper**. Yes. I have been in the manufacturing environment, in the direct manufacturing environment for 14 years of my experience. And I have certainly been associated very intimately with the work measurement, work measurement management, particularly for the last 3 years.

I have participated in many surveys and audits of defense contractor work measurement systems. And I believe I certainly have the capability to discuss the management and how the data is used or not used within the defense industry.

Senator **Grassley**. Are you an industrial engineer?

Mr. **Hooper**. No, I am not.

Senator **Grassley**. Mr. Haugh, what about hands-on experience with work measurement?

Mr. **Haugh**. Yes. While not being a work measurement cultist, so to speak, I have had a relatively large amount of direct hands-on experience in the development of labor standards and work measurement programs, having spent about 8 years at one time in the work measurement area prior to moving on to production control scheduling, shop loading, et cetera.

When making the surveys that I previously mentioned, it was also my responsibility to review and evaluate the contractors' work measurement system.

Senator **Grassley**. Mr. Haugh, I'm interested in something that Mr. Hooper referred to. I believe he said that standards cannot be constructed or achieved until stable mature production times have been met.

Now, yesterday, we had some discussion on this. For sure, Mr. Castle would contradict that and, to some extent, so would Mr. Hintze.

But I would like to ask you to comment on whether you agree.

Mr. **Haugh**. Initially when standards are set, they are set on the existing condition, less any bad methods or manufacturing techniques. You are certainly not going to wait until everything is perfect before you set a standard that, may never happen. You are always going to have part shortages, design and method changes, tool changes, etc., that will impact the standard. Those are never ending, they do not every go away completely.

However, if you waited until everything was perfect before you set a standard, or if you convinced yourself that you could never attain the standard that you have set until conditions are perfect, you would never set a standard and you would go on forever with uncontrolled shop loading and unmeasured workforce.

Senator **Grassley**. I suppose standards in and of themselves mature to some extent.

Mr. **Haugh**. Absolutely. Absolutely.

Mr. **Hooper**. Mr. Chairman, may I comment on that, please?

Senator **Grassley**. Yes.

Mr. **Hooper**. I think it is important to keep in mind two aspects of what we are talking about here. One is the ability of an individual operator to perform against the standard at the operation level. There is no doubt that that can occur. That can occur in very early production or development at that particular level.

The discussion seems to be, though, when you accumulate all the hours together at a factory level, and you have production program that is still in development, unstable, you do not have all of the tooling, the parts are not flowing properly. When you add all those up is when the performance to standard is much different than one.

Senator **Grassley**. Mr. Haugh, following up on what you just said, it appears you are saying standards do not demand perfect conditions. And unless I misread Mr. Hooper, it seems he is saying that they do demand perfect conditions.

Mr. **Haugh**. Well, I am not even sure that Mr. Hooper is saying that they demand perfect conditions.

I think what Mr. Hooper is saying, if I understand what he is saying anyway, is that when we roll up the standard to a total weapons system area, that maybe all the people along the line are not able to meet the standard. Maybe there are certain areas within the weapons system manufacturing where you are pushing the state of the art, and consequently are going to move a little slower toward attaining standard in these areas, but certainly not across the board.

When you set a standard, the industrial engineers that I know, set a standard, at operation level. It is not set at aircraft engine or system level. It is set at an operation level. Operation standard are then rolled up to a cost center or work center level and subsequently to a total end item level, as a result you can measure performance at the operator level, cost center level, or the total overall effectiveness of the organization within the direct labor area.

Senator **Grassley**. I would like to note that what you just said contradicts—and I am glad to have that for the record—one of the points made in DOD's memo that was put out on the issue, or as far as the legislation is concerned.

Mr. Hooper, in continuation of how far along in production or how much perfection you have to have before you can start instituting the standards, I would like to note that at Hughes, for instance, over 20,000 missiles were produced and the realization factor was 17 to 1.

When you consider that, where does that come on the learning curve?

Mr. **Hooper**. The data, sir, that you are referring to, I believe it was my impression that the 17 to 1 was for the Maverick Program, for the RI Maverick Program which was still in development at the time that has been produced, rather than having 20,000 missiles.

Senator **Grassley**. Are you saying that they had not produced that many missiles and—well, maybe I ought to ask you to repeat what you just said.

Mr. **Hooper**. The data—to my recollection, the 17 number stands out as being reflective of the performance of the IR Maverick Program.

At the time the 17 was being performed, the IR Maverick was still in a development program and less than a hundred missiles had been built, not 20,000.

Senator **Grassley**. Well, I was speaking specifically of the TV Maverick.

Mr. **Hooper**. The TV Maverick, yes, sir, I believe they had built over 20,000. But I do not believe they were performing at——

Senator **Grassley**. What was the realization factor on that, the TV Maverick?

Mr. **Hooper**. I do not have those exact numbers. My recollection——

Senator **Grassley**. You could submit them for the record.

Mr. **Hooper**. I could submit that; yes, sir.

[Information follows:] [1]

Senator **Grassley**. Mr. Haugh, what was the rationale behind the original push in DOD to institute Mil Standard 1567, and what were the factors causing concern about work measurement in defense plants?

Mr. **Haugh**. Early in 1970, we had conducted should cost reviews at the General Electric plant in Philadelphia. And at Bell Aerospace in Buffalo where they made the fourth stage (Post Boost System) for the Minuteman Missile.

During the course of these studies, we discovered that, the contractor really had tough labor standards; and that their, Industrial Engineers were very conscientious and capable in establishing these standards. However we could not determine how the standard was used after it was developed.

We found that—a full investigation showed that they did use them in their shop loading to some degree; however they used them mainly early in the program for training, equipment justification, plant layout where they could be used to avoid shift in major equipment.

When we queried the industrial engineering force in both these organization, about the use of engineered standards in purposal responses we found that they really did not know what happened to their inputs after they had priced something and sent it up to the contracts people. What they saw when it came back, they often did not recognize.

They confided in us frankly that they really did not know why cost were being project so high.

We then tried to get a copy of their standards at Bell Aerospace, they were naturally reluctant to give them to us, but we kind of chided them into it. Finally we got a copy of their labor standards. It was called a Labor Standards Listing; that is, it was a computer listing of the end items/parts and the standard hours required to produce each part. We took their standards to Norton Air Force Base. Gave it to TRW and asked TRW to pull the drawings and parts breakdown for all of—the parts on the fourth stage and make sure that every part on that system was covered. If it was a buy part, we had no labor standard information on subcontracted items. We were concerned only about those parts being made at Bell Aerospace.

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[1] Material unavailable at press time.

We ended up developing what we call an end item standard for the post boost system for Minuteman. We knew we were going to go into negotiation in 4 months so we developed this background to use in negotiation. We asked the contractor what kind of efficiency he thought he was experiencing and he said about 70 to 75 percent.

We had made several ratio delay studies during our production review that indicated to us that his efficiency it was somewhat less than that. We then took the standards that we had developed and modified it by the 75 percent efficiency factor, and developed our negotiating position.

When we got into negotiating, the contractor was naturally reluctant to negotiate that position. He said he was not going to take, our standards and our numbers and negotiate in that manner. Well, you know, we finally convinced him that, hey, these are your numbers, not ours; they are your standards, it is your parts list, everything was developed from information provided by Bell.

We were able then to negotiate that position for touch labor which resulted in a reduction of around $28 million in contract costs. This by the way, was the sixth buy. Subsequently, however, there was some reluctance on the part of Minuteman procurement personnel to incorporate should cost techniques on all future Minuteman negotiations. We tried at that time to get some procurement regulation going, but were met with a lot of resistance and flack from our own people. So I just backed off.

Subsequently, I transferred to Kirtland and Project Ace came along. So I tried it again. There was some reluctance on the part of the Project Ace panel to accept our projections on expected direct labor improvement if a mil standard were to be adapted by our contractors.

General Nunn at the time, he was kind of reluctant to press with General Jones the writing and inclusion of the mil standard on Air Force contracts. But he left us an opening. He said "if you can convince me that this thing will work, well, then, OK, you can leave it in the Project Act folder, move ahead and develop it." So we asked Autonetics, who we understood had what they thought was a very good work measurement program, and that Dr. Paul Wallich, who had developed that program, would be glad to come and give the general a pitch on the Autonetics work measurement program.

We subsequently invited Dr. Wallich to Kirtland AFB. He gave a presentation to the Project Ace panel, who then gave us the go ahead on the mil standard.

Dr. Wallich's involvement and the items I have mentioned are in evidence in the written record that I would attach to my summary when I submit it. The committee can look at them, but as I remember Autonetics said that in the 5 years since they had implemented discipline work measurement system, there had been a 66-percent increase in efficiency at Autonetics. That was 66 percent. Air Force

(AFCMD) industrial engineering people at Autonetics who had been there during that period said that they could validate that increase. They believed that to be true.

At a later meeting of the MTM Association, Mr. Bill Mitchell from Autonetics made a presentation to the MTM Association on its 25th anniversary work measurement seminar where he described the Autonetics Work Measurement Program is innovative he stated that the work measurement system at Autonetics was measuring low quantity production on critical high tech items, and that they were being successful in doing this.

With the Autonetics input and a little more support from other DOD studies, we were able to convince the Project Ace panel that we should develop the mil standard. I was given the task of writing the initial version of the mil standard. We called industrial engineers to Kirtland AFB from all over the country and got their inputs. We also solicited and received input from the Aerospace Industry Association, and in every case we tried to use what was submitted to us. We ended up with what we thought was a usable mil standard. We then started coordinating with the services, and as you are aware, it has been a long, hard process. The standard has gone through several iterations since then, the last of which I am not too pleased with.

[Information follows:]

Air Force Contract Management Division

Kirtland Air Force Base, New Mexico 87117

A Study of Application of MIL-STD-1567 on AFCMD Administered Contracts

Prepared for
General Robert T. Marsh, Commander
Air Force Systems Command

By
Air Force Contract Management Division
Kirtland AFB, NM 87117

31 Oct 1983

Objective. To determine the extent of application of MIL-STD-1567 across AFCMD-administered DOD contracts and to provide an assessment of work measurement system.

Executive Summary

We surveyed 24 contractors under our cognizance.

a. There are 193 contracts which meet the requirements for application of MIL-STD-1567 based on AF criteria of $20M annually or $100M cumulatively.

b. There are 53 contracts with MIL-STD-1567 requirements, 37 of which have tailored MIL-STD-1567 and 16 contracts have MIL-STD-1567 requirements in full.

c. None of our current contracts have requirements of MIL-STD-1567A, published on 11 Mar 83.

d. We surveyed 24 contractors; all 24, with one exception, could meet requirements of MIL-STD-1567A with very little extra work. One division of Aerojet General, the Tactical Systems Co, has some form of work measurement system, but will require major changes to meet MIL-STD-1567A requirements. The other two DOD-oriented Divisions of Aerojet would pass with a little work.

e. To set time standards, seventeen of the contractors surveyed use Methods Time Measurement (MTM), four of which use a combination of MTM and Time Study. Two use the Maynard Operation Sequence Technique (MOST), two use Motion Time Survey (MTS), one uses work factor, and two use other techniques for developing standards.

f. There are 637 people engaged in work measurement at our 24 plants; the average being 27 people per location.

Contracts with Full MIL-STD-1567 Requirements

Program	No. of Contracts	Contractor	Standards Coverage Type I/Type II (Percent)
Strategic Radar	1	Boeing Military Airplane Co	93/7
OAS/CMI FSD	1	Boeing Military Airplane Co	95/5
B1B Avionics	2	Eaton/AIL	5/94
T-46A	1	Fairchild Republic Co	80/20
F-16	3	General Dynamics	83/17
AMRAAM	1	Hughes Aircraft, Missile Systems Gp	64/36
Peacekeeper	2	Northrop	0/100
DSP	1	TRW	90/10
MILSTAR	1	TRW	90/10
FLTSATCOM	1	TRW	90/10
F-16 IMPR Radar	1	Westinghouse	85/15
Navy ASPJ	1	Westinghouse	85/15
	16	8	

Contracts with MIL-STD-1567 Requirements - Tailored

Program	No. of Contracts	Contractor	Standard Coverage Type I/Type II (Percent)
Peacekeeper Stage II	2	Aerojet Propulsion Co	78/22
Peacekeeper	2	AVCO	40/60
E-3A	4	Boeing Seattle	88/11
ALCM	3	Boeing Seattle	93/7
ASAT	1	Boeing Seattle	44/66
Peacekeeper	1	Boeing Seattle	TBD
B1B	2	Boeing Seattle	TBD
IUS	2	Boeing Seattle	94/6
KC-135R	2	Boeing Wichita	97/7
CSRL	1	Boeing Wichita	TBD
C-17	1	Douglas Aircraft	0/100
F-16	2	General Dynamics	83/17
F-101	1	GE Cincinnati	16/84
DSCS	1	GE Space Division	18/82
MK-21 Fuze	1	GE Space Division	0/100
C-5B Prod	1	Lockheed GA	80/20
C-5 Wing Mod	1	Lockheed GA	80/20
C-5 BOA	1	Lockheed GA	80/20
Peacekeeper AT&SS	1	Martin Marietta Denver	88/12
Peacekeeper	2	Rockwell Anaheim	80/20
B-1B Production	1	Rockwell NAAO	49/51
Peacekeeper	2	Rockwell, Rocketdyne	87/13
Peacekeeper FSED	1	Thiokol	72/28
Peacekeeper FSED	1	Thiokol	87/13
Total	37	13	

Contracts Meeting the Criteria for Application of MIL-STD-1567*

Service	Program	No. of Contracts	Contractor	Work Measurement System	Standards Type I/Type II (Percent)
Navy	Quick Strike Mine	1	Aerojet Tech Sys	Factory wide Does not meet 1567 (Historical)	0/100
Navy	Standard Msl	4	Aerojet Tactical	Factory wide Does not meet 1567 (Historical)	0/100
AF	MM II Stg II	2	Aerojet Propulsion	Factory-wide, being implemented to 1567	0/100
Navy	Polaris Stg II	1	Aerojet Propulsion	"Engineered"	0/100
AF	JT3D (KC-135 Eng change)	3	Boeing, Wichita	"time-study"	95/5
AF	F4 PDM (Depot Maint)	1	Boeing, Wichita	"time-study"	95/5
AF	ENV.C.S. (Environmental Cont Sys)	1	Boeing, Wichita	"time-study"	95/5
AF	EMP HARD. (Electro-magnetic pulse)	1	Boeing, Wichita	"time-study"	95/5
AF	OAS/CMI (Offen Avionic Sys and Cruise Msl Integ) Lot 1, 2, 3, 4, 5, 6	2	Boeing, Wichita	"time-study"	97/3
AF	ALQ-172 (Radar)	1	Boeing, Wichita	"time-study"	97/3
AF	B-52 CMI (Cruise Msl Integ)	1	Boeing, Wichita	"time-study"	97/3
AF	CSRLI (Common Strategic Rotary Launch Integ)	1	Boeing, Wichita	"time-study"	97/3
AF	Maverick (IR)**	1	Hughes Aircraft Msl Systmes Gp	Standard Data	32/68
AF	ECP 405 (Re-Skin KC-135)	6	Boeing, Wichita	"time-study"	97/3
Navy	A-4 (A/C Overhaul)	1	Douglas Acft Co	MTM, MOST, Work Factor	0/100
AF	ACES II (A/C Seats)	4	Douglas Acft Co	MTM, MOST, Work Factor	0/100
AF	KC-10	2	Douglas Acft Co	"	0/100
AF	C-9A/B	2	Douglas Acft Co	"	0/100
AF	A-10A	1	Fairchild	Factory-wide, MTM, Time Study	80/20
AF	F 110 (A/C Eng)	2	GE Cin	Motion Time Survey	0/100
Navy	F 404 (A/C Eng)	1	GE Cin	Motion Time Survey	37/63
AF	TF 39 (A/C Eng)	2	GE Cin	Motion Time Survey	0/100
AF	J 79 (A/C Eng)	2	GE Cin	"	0/100
	(Classif.)	1	GE Cin	"	0/100

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Service	Program	No. of Contracts	Contractor	Work Measurement System	Standards Type I/Type (Percent)
AF	F-15 Radar	6	Hughes, LA	Factory-wide, MTM-4M, Does not meet 1567	90/10
Navy	F/A-18 Radar	1	Hughes, LA	"	85/15
Navy	F-14 WCS (Weapons Control Sys)	2	Hughes, LA	"	90/10
Army	M-65 LAAT (Fire Cont Sys)	1	Hughes, LA	"	90/10
Army	Bradley (Fire Cont Sys)	2	Hughes, LA	"	90/10
Army	G/VLLD (Ground Veh Laser Locator Designator)	2	Hughes, LA	"	80/29
Navy	A-6 TRAM (Target Recognition . Multisensor)	3	Hughes, LA	"	90/10
AF	MVS/ASAT (Miniature Veh Sensor/Anti-Satellite)	1	Hughes, LA	"	TBD
Navy	Trident	1	Hughes, LA	"	90/10
Army	M-1 ABRAMS	2	Hughes, LA	"	90/10
Army	GLD (Ground Laser Designator)	1	Hughes, LA	"	80/20
Navy	Target Detector	2	Hughes, LA	"	97/3
Navy	F-18 TRNR (Trainer Simulator)	2	Hughes, LA	"	TBD
AF	Maverick (SM) (Msl)	1	Hughes, Tucson	Standard Data	64/36
Navy	Phoenix (Msl)	3	Hughes, Tucson	Standard Data	27/73
Army	WSD (Weapon Sys Dev)	1	Hughes, Tucson	Standard Data	TBD
Army	TOW (Tube Launched, Optically Tracked, Wire Guided Msl)	2	Hughes, Tucson	"	75/25
Navy	ARBS (Angle Rate Bomb Sys)	1	Hughes, Tucson	Standard Data	TBD
Army	Roland	1	Hughes, Tucson	Standard Data	TBD
AF	C-141	2	Lockheed, GA	Standard Data Group Timing, MTM	Fab 80/20 Assy 0/10
AF	C-130 Prod	8	Lockheed, GA	"	Fab 80/20 Assy 0/10
AF	Non C-5 BOA	1	Lockheed, GA	"	80/20
Navy	US Navy Slep Program (Service Life Exten Prog)	1	Lockheed, GA	"	Fab 80/20 Assy 0/100
AF	ESS (Equip Supt Sys)	1	Lockheed, SV	MTM, Factory-wide with Exemptions	TBD
AF	Talon Gold (Telescope Payload)	1	Lockheed, SV	"	TBD
Army	HOE (Homing Overlay Experiment)	1	Lockheed, SV	"	TBD

Service	Program	No. of Contracts	Contractor	Work Measurement System	Standards Type I/Type II (Percent)
NAS	Space Tel. (Space Telescope)	1	Lockheed, SV	"	TBD
AF	PLSS (Precision Location Strike System)	1	Lockheed, SV	"	TBD
AF	TIII-CLS (Titan III)	1	Martin-Marietta	Factory-wide MTM	88/12
AF	GSS (Ground Supt Sys)	1	Martin-Marietta	"	88/12
AF	T III Product.	1	Martin-Marietta	"	88/12
NAS	CCMS (Checkout Control Monitor Subsystem)	1	Martin-Marietta	"	88/12
NAS	ET (External Tank)	1	Martin-Marietta	"	88/12
AF	MISC	1	Martin-Marietta	"	88/12
AF	T-38 Wing	2	Northrop	Factory-wide MTM-4M, could meet 1567	Fab 92/8 Assy 0/100
Navy	F/A-18	1	Northrop	"	Fab 92/8 Assy 0/100
AF	F-5 E/F	2	Northrop	"	Fab 92/8 Assy 0/100
Navy	TF 30 (A/C Eng)	2	P&W EH	MTM, MOST Work Factor[1]	68/32
Navy	J 52 (A/C Eng)	1	P&W EH	MTM, MOST, Work Factor	58/42
AF	TF 33 (A/C Eng)	1	P&W EH	"	56/44
AF	F 100 (A/C Eng)	1	P&W EH	"	88/12
AF	CIP X (Component Improv Prog)	1	P&W WPB	"	80/20
AF	F 100 (A/C Eng)	2	P&W WPB	"	80/20
AF	GPS (Global Position Sys)	1	RI, Anaheim	MTM, Factory-wide	70/30
AF	B-1B	2	RI, Anaheim	"	70/30
Navy	ESGM (Electronic Supt Gyro Monitor)	3	RI, Anaheim	MTM, Factory-wide	70/30
Navy	SDMS (Ship Data Multiplex Sys)	1	RI, Anaheim	"	70/30
Navy	OMNIBUS (Blanket Repair Order)	1	RI, Anaheim	"	70/30
AF	B-1B FSD	1	RI, NAAO	MTM, Program-Basis Lot I Lot II	 49/51 79/21
AF	SIGMA (Laser)	1	RI, Rocketdyne	MTM-4M-V	0/100
NAS	RS-27 (Rocket Eng)	1	RI, Rocketdyne	"	0/100
NAS	SSME (Space Shuttle Main Engine)	3	RI, Rocketdyne	"	0/100

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Service	Program	No. of Contracts	Contractor	Work Measurement System	Standards Type I/Type II (Percent)
Navy	Trident (Sub Msl)	5	Thiokol	MTM, Time Study	51/49
Navy	Standard Msl	1	Thiokol	"	2/98
Navy	HARM (Msl)	1	Thiokol	"	2/98
NAS	Shuttle (Booster)	1	Thiokol	"	8/92
AF	Misc Contracts	3	TRW	MTM	92/8
AF	ALQ-131 Engr Support (Radar)	1	Westinghouse	MTM	85/15
AF	AN/ALQ-131 (Radar)	2	Westinghouse	MTM	85/15
AF	FB-111 (Radar)	1	Westinghouse	MTM	85/15
AF	APG-66 (Radar)	1	Westinghouse	MTM	85/15

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*Do not have MIL-STD-1567 in the contract.
**Maverick (IR) Segment II will have DOD MIL-STD-1567A.

Contractors Who Could Meet Requirements of MIL-STD-1567A With Minor Changes

1. Aerojet General Corp, two divisions - The Tech Systems Co and The Strategic Propulsion Co
2. AVCO, Wilmington, MA
3. The Boeing Co, Seattle, WA
4. The Boeing Military Airplane Co, Wichita
5. Douglas, LB
6. Eaton AIL
7. Fairchild Republic Co
8. General Dynamics, Ft Worth TX
9. GE Cincinnati
10. GE Space Division, Philadelphia
11. Hughes Aircraft Co, LA
12. Hughes Missile Systems Group, Tucson
13. Lockheed Georgia Co
14. Lockheed Missile & Space Co
15. Martin Marietta, Denver Aerospace
16. Northrop
17. Pratt & Whitney, East Hartford
18. Pratt & Whitney, WPB
19. Rockwell, Canoga Park
20. Rockwell International, Anaheim
21. Rockwell International NAAO
22. Thiokol
23. TRW
24. Westinghouse

Contractors Who Could Meet Requirements of MIL-STD-1567A With Major Changes

1. Aerojet Tactical Systems Company, a Division of Aerojet General

Work Measurement System in Use

Company	Plant-Wide	Program Basis	Work Measurement System In Use
Aerojet Strategic		X	MOST, Historical Data
AVCO		X	MTM-4M
BAC	X		MTM-4M-OMNI
BMAC	X		Time Study
Douglas		X	Work Factor
Eaton AIL		X	MOST
Fairchild	X		MTM-4M, Time Study
GD-Ft Worth	X		MTM-4M
GE Cinn	X		Motion Time Survey
GE-VF		X	Motion Time Survey
Hughes LA	X		MTM-4M
Hughes Tucson	X		"Engineered"
GELAC		X	MTM, Time Study
LMSC	X		MTM
Northrop ED		X	MTM
Northrop A/C	X		MTM-4M
P&WA EH	X		MTM, Time Study
P&WA WPB	X		MTM
RI Anaheim	X		MTM
RI NAAO	X		MTM-4M-V
RI Rocketdyne	X		MTM
Thiokol		X	MTM, Time Study
TRW	X		MTM
WEC	X		"Engineered"

Problem Areas

The following problem areas were noted across all AFCMD contracts:

a. MIL-STD-1567 requirements often omitted from the contract even though the contract met the application criteria and the contractor has an existing plant-wide work measurement system.

b. Widely varying approach among buying offices. It is not uncommon to have two or three versions of tailored 1567 with a single contractor.

c. Application guidance needed.

d. Flowdown to subcontractors often omitted.

e. MIL-STD tailored for no apparent reason.

Senator **Grassley**. A young man like you, you have seen a great deal of your life devoted to mil standard and the evolution of it—or the lack of evolution.

Mr. **Haugh**. About 11 years.

Senator **Grassley**. Well, I have a chronology of mil standard 1567 and it dates all the way to about the time you said, 1966. That was 20 years ago. And still, yet today, everybody seems to think that we need to study this issue of work measurements a little longer. I suppose this might be a short period of time in government but it sure is a long period of time in my life. We are going to have to study another 20 years maybe, I do not know. But, you know, that is the feeling people are giving us.

Mr. **Haugh**. Mr. Chairman, I think your thoughts are the same as those offered by General Driessen when he took command of the FCMD from General Nunn. I gave him a briefing on where we were with the mil standard. I told him that we were waiting for DOD coordination. He asked at that time how long we had been waiting, and I said around 11 months. He said, "I think that is long enough." We will write a letter to General Driessen and tell him that we should implement mil standard in the Air Force immediately and not wait for the rest of the services.

Senator **Grassley**. Well, my question to both of you is why has it taken so long to get this work measurement program implemented?

Do you want to start?

Mr. **Haugh**. Oh, sure.

I think that, you know, there was some real reluctance on the part of the contractor. And I can understand this. They could see that we were asking for information that had never before been made available to the Government, or which may have been available to the Government but the Government was not smart enough to ask for it or did not know how to use it.

But the real reluctance was in that we are going to give these guys this stuff and it is going to come back and haunt us during negotiations.

Senator **Grassley**. Do you want to repeat that point again? That is pretty important what you just said, that the Government did not know it existed or did not know how to use it.

Mr. **Haugh**. That is right. There were cases where we found that the contractors had reasonably good working measurements programs that they were using acceptable labor standards. But sometimes in the buying organization or in the contract administration, the negotations people were not aware or did not feel the need to use them.

The Air Force or the Department of Defense was not all pure in that area. That is for sure.

Senator **Grassley**. Do you want to continue then where I interrupted you or were you done?

Mr. **Haugh**. That is it.

Senator **Grassley**. OK.

Mr. Hooper, I would like to have you answer my question: How long before we're going to get the work measurement program implemented?

Mr. **Hooper**. I hope it comes right away in——

Senator **Grassley**. Repeat that again?

Mr. **Hooper**. I hope the implementation comes right away.

Senator **Grassley**. OK.

Mr. **Hooper**. In Air Force Systems Command, we are putting heavy emphasis on making sure it comes about.

General Skantz, the commander of Air Force Systems Command, is an avid supporter of work measurement. It is required by policy and regulations that it be implemented on all acquisitions that meet the threshold criteria of the mil standard.

We have raised the level of authority that is required to either waive the mil standard or to tailor it up. They are being very tough on allowing contracts that do not have the mil standard. We are requiring program managers to present data on a regular basis to the commander using these data.

So it is certainly within Air Force Systems Command we are actively and aggressively pursuing the application.

Recently, the Joint Logistics Commanders, the four stars of each of the services, signed a joint agreement supporting the concept of work measurement. And so that hopefully when all of DOD moves forward with the concept, it will be readily implemented.

Senator **Grassley**. For the record, Mr. Haugh—by the way, is it Hough or Haugh?

Mr. **Haugh**. It is Haugh, H-a-u-g-h. It is like h-a-w.

Senator **Grassley**. OK.

Now, you are the original author of 1567?

Mr. **Haugh**. Yes, sir.

Senator **Grassley**. And all the services have embraced it, at least in principle?

Mr. **Haugh**. I think in principle, yes.

Senator **Grassley**. And some have in action?

Mr. **Haugh**. Some have—if my information is correct, some have, yes.

Senator **Grassley**. Would each of you describe what is meant by tailoring, whether or not this is a good idea and why?

Mr. **Haugh**. I think I would like—if it is OK with Charlie, I will start.

I think that tailoring is not a bad word in itself. There are different manufacturing management systems also; the commodity often differs from contractor to contractor. So I think that some tailoring should be allowed. However, it is the degree of tailoring and what you are tailoring that really needs to be closely controlled. It is possible that if we try to bend this thing to fit every kind of work measurement or management system, we are going to end up with something that we won't even recognize as mil standard 1567 being implemented in every contractor's facility around the country. And, as a result, be unable to determine whether or not they were meeting the requirements or spirit of the original mil standard.

Indiscriminate tailoring of the standard would compromise it to the point where it would be completely ineffective.

As I say, I am not opposed to tailoring. I think that there are times when you need to tailor it. Perhaps even at different times during the program, cycle if the contractor's implementation plan indicates that he is going to tailor certain portions of the mil standard during a full-scale development, but is going to put them back in during the production phase, I would not take exception to that. I think that there has to be some degree of flexibility allowed.

The important thing is to control the degree of tailoring to make sure you are really not giving away the farm and that you have something where contractors are being measured fairly.

Senator **Grassley**. Before I ask Mr. Hooper to comment on tailoring, you mentioned you were upset by what is happening now to mil standard 1567. I would like to have you elaborate on that.

Mr. **Haugh**. Well, I think there have been some significant changes in the mil standard. I mean, they may at first reading seem insignificant or minor, but to me they are significant and of major importance.

As I recall going through the standard, there are cases where we say we will use standards "when available." What does "when available" mean? I do not understand that kind of compromise completely.

We left shipbuilding out of the standard. I do not understand that. You know, I think that what we forget is that even though we are building "onesys" and twosys," and that is a phrase I am real familiar with, having come from the space system, where they do build a lot of ones and twos in satellites, and so forth. Every place I went at space systems and tried to implement the mil standard, someone would stand up and say, "Yeah, but we're only building one, two, or three or these items so we don't see the need for a mil standard in this area."

But the fact of the matter is these contractors do all their business with the Government. So they should have a work measurement program. And they are not going to establish a work measurement program to control two satellites, perhaps not. But they certainly should be required to establish a sound work measurement program to control all their business with the Department of Defense.

Further, when you are building one, two or three satellites, you know, you are putting in 3,000 Clico clamps to hold, to skin until you fasten it together. You are also putting in thousands of fasteners, solar panels, and so forth. And that is the operation level. You are not talking about work measurement at the end item or cost center level. You are talking about the operator, performing an operation.

Even on a space shuttle, people will be putting those little tiles on the outside. But they are putting thousands of them on. They are not utting on one or two. So a method study could also be important in that area.

I get a little discouraged with people who tell me you cannot set a standard on a ship or you cannot set a standard on "onesys" and "twosys" because you absolutely can.

Senator **Grassley**. I think you ought to repeat that point because that is important.

Mr. **Haugh**. I think that you can set a standard on onesys and twosys with great accuracy as long as there are operations within the whole that are repetitive.

Now, if as in certain satellites you are going to install one wave tube, you know, that may not be cost effective to set a standard, but then that is also a very, very, small portion of the total actual labor.

Senator **Grassley**. You know, what you just said is contrary to what we have been told by DOD——

Mr. **Haugh**. I understand that.

Senator **Grassley** [continuing]. And by the industry.

Mr. **Haugh**. I understand that completely.

But I do not think that you have been told that, sir, by anyone who has had hands-on experience, who has gone out and set standards in these areas.

Senator **Grassley**. So that causes me to ask you, Mr. Hooper, on tailoring. But just what was said here then causes me to ask you where do you get your information?

We are told by Mr. Haugh one thing and then we get different stories from DOD and from the industry.

Mr. **Hooper**. I, for the most part, agree with Mr. Haugh.

We pursue work measurement on satellite contracts that have very limited production quantities. Work makes sense.

I would not make a broad statement and say that work measurement is not applicable to the systems that production quantities are limited because there are many operations in there that are repeated many times even though the total quantity is small.

And it kind of leads me to the opportunity to comment on the tailoring because there is an appropriate example where tailoring can be used to its fullest advantage where you would like to have work measurement on a program, but perhaps there are some aspects of the job that are not cost-effective to implement the standard on. But by effectively tailoring the requirements of the mil standard, you can capture those areas where it is cost-effective to do so.

Senator **Grassley**. Perhaps I have misunderstood between what you just said and what you said either in your previous question or in your statement. It seems to me that you are contradicting yourself when you say you agree with him on smaller numbers, that you can have the standards, and when I understood you to say that you had to have a mature system.

Mr. **Hooper**. Well, sir, I think what I said before was that to achieve the standard level, you need a mature production. But I think my personal feeling is there are a lot of advantages to using labor standards even when you may not even anticipate actually achieving the standard. That is, by having a standard to measure against, and then measuring it even on low quantity work, it does give you the capability to understand where inefficiencies lie and those of management, you can drive those labor hours at least closer to the standard.

Senator **Grassley**. Mr. Haugh, do you have to have—maybe this is too obvious a question—but do you have to have mature systems to have standard?

Mr. **Haugh**. Absolutely not.

Senator **Grassley**. OK.

The mature systems to meet standard?

Mr. **Haugh**. No. I think you can come closer, but the more maturity you have, probably the closer you are going to come as a natural progression of things.

But I do not think that you have to have a totally mature system to achieve standard, absolutely not. Because a standard is really going to change to reflect the current method and standard hour content.

If a method changes, the standard changes, which brings one back to what Charlie had talked about earlier, when he talked about the standard or the ratio of standard to actual hours in a commodity that had gone from 125 to 145, I guess, and back down to 125 again.

You know, that can happen if you are measuring performance against a given standard. And you make a methods improvement that reduces the standard time, then naturally there would be less time required to do the job.

But if you did not get rid of the people, if you left the people in place, then you would be ineffective, and you would have a larger ratio. And then, when you finally got rid of the people, you would go back down to normal again.

But just making a methods improvement and reducing the standard, if commensurate action is not taken to reduce the staffing, you are not really going to affect the overall cost.

Senator GRASSLEY. Mr. Haugh, I am glad that DOD officials are here to hear your testimony.

I would like to rephrase a question that I previously asked you, Mr. Hooper, and I have some information on this TV Maverick missle that you were referring to. It shows—this would be after 20,000 production—it shows a realization factor of three to one, and it shows a scrap and rework of 30 percent.

So, I'll go back to the question that I originally asked you. Where does that come on the learning curve?

Mr. HOOPER. That particular program at that particular time, it would be my opinion that that realization factor is much too high, much too high. And certainly the scrap and rework rate is unacceptable.

Senator GRASSLEY. Are there any other examples like this that the Congress should be made aware of and that we ought to know about?

Mr. HOOPER. There are examples within the Air Force studies that we performed where the performance, the standard in any given point in there, if the life cycle was higher, than certainly we would expect it to be.

As a part of a major study that we did, we looked at standards, how they were being used in the defense industry, our conclusion from that was that, in general, there did not seem to be a problem in establishing standards. The methodology seemed to be sound. There did not seem to be a problem in measuring against those standards.

The problem seemed to be in taking aggressive actions along the way, irrespective of the actual number it was performing the standard, taking those necessary actions to make as much improvement as quickly as possible.

Most of the defense contractors that we looked at seemed to rely on the improvement curve and allow that improvement curve to drive down the total actuals rather than taking actions in relationship to the standard.

Senator **Grassley**. You used work measurements to discover that?

Mr. **Hooper**. Yes.

Senator **Grassley**. OK.

When these factors are too high, what do you do about it?

Mr. **Hooper**. There are certain management actions that we can take in terms of encouraging the contractor to make the necessary improvements. If it is a firm fixed price contract, then hopefully by the time the next follow-on buy is performed by using labor standards for the pricing negotiation, it will give us enough insight into where these inefficiencies are, the demand that they be taken out, and that the Air Force not pay for those.

Senator **Grassley**. Is that generally heeded when that sort of advice or sort of position is taken by you or people in like positions, that action ought to be taken once you discover that the situation is not up to standard? Maybe that is not the quite correct terminology, but at least reasonable.

Do you get favorable response from people that you report that information to?

Mr. **Hooper**. No always certainly.

If you look at a contract that has already been awarded, and there have been a lot of people involved in trying to determine the proper price and then negotiate that price, and then for a third party to come along later and say that perhaps you negotiated the price higher than it should be, it is certainly not always accepted as well as you might hope it would be.

Senator **Grassley**. Well, you did say that you used work measurement to discover these problems?

Mr. **Hooper**. Yes, sir.

Senator **Grassley**. OK.

Was work measurement used to discover a quality problem?

Mr. **Hooper**. Yes, it certainly can. It is an important tool in not only discovering actual quality problems, but I believe that it leads you to, in some cases, to predict possible quality problems that may occur later.

Senator **Grassley**. So, you would not subscribe to the theory that labor standards adversely impact quality?

Mr. **Hooper**. No, I would not.

Senator **Grassley**. And that is what DOD said about our efforts to establish those sorts of standards.

Mr. Haugh, you have been cited in a recent article that I read saying that work standards can be devised to take into account low production rates and learning curves.

I would like to have you explain, if you would, please, how this could be done, especially since it seems to contradict statements that have been made by DOD officials.

Mr. **Haugh**. I guess the easiest way to explain it is that if you have a jet engine assembly line, for example, and if you are going from one model to another model, there is a transition period that you go through, I believe learning curves can be used appropriately.

I think that in the area of machine operations where you have a machinist doing a function, I have a lot of doubt in my mind about learning curves in this area. I do not think you can teach a machinist how to read a blueprint or how to cut or how to set speeds, et cetera. Those things are required in his craft; I do not think that you teach a machinist those things.

First of all, I would like to qualify my comments by saying I think that there are areas where learning curves are appropriate and areas where they are not. And where they are, you have to be very, very careful on which slope that you use when projecting the number unit at which you expect to achieve standard.

Now, I have done this. I have done, as Mr. Hooper suggested earlier, from one of the private contractors that he was referencing, well, I have gone in on a final assembly area for jet engines and I have developed an assembly labor standard. Reviewed past performance and determined that it would probably take three times standard to do the first unit. Put it on an 86-percent slope and dropped it down and said, OK, at unit 15 or 20 or 25, or whatever it came out to be, that is where we expected to meet standard.

But it was certainly not out there at, you know, 1,000 which people talk about, which is—I cannot agree to that at all. Not even remotely.

Senator GRASSLEY. Let me quote to you from another article that I have read, a quote attributed to you:

> The problem is that you have got too many people to accomplish the work that needs to be accomplished. The private industry won't put up with it. If you walk around plants in the competitive aircraft industry and walk into any defense contractor facility, you see a marked difference in the place. It is not a competitive environment.

Now, this seems to bear a great deal of connection with the central issue of this hearing, the importance of the central issue.

Do we have too many defense plants with too many workers, and could this be one reason that we see these huge numbers or these huge, yes, it would be numbers of actual labor hours charged by contractors to work what, according to your standards, ought to take maybe two to six times less?

Mr. HAUGH. Mr. Chairman, I can respond only to those contractors that I have looked at. And I have looked at several. But I would have to say unequivocably yes. There is an absolute direct relationship. And I think this can be borne out by many industrial engineers who have been on the teams that have gone into contractor plants and made ratio delay studies, random sampling studies, where we would indicate—whether the employee was working or idle.

We are not trying to determine why he is idle or anything else. Just work versus idle. We never found any case where work exceeded 70 percent.

What we found in most cases, was that at least 30 percent of the workforce was idle in those plants.

Senator GRASSLEY. Well, let me ask you a subsidiary issue that is really not the main point but maybe ought to be even brought out here.

In your visiting with individuals, you know, that rank and file person down there on the assembly line or wherever it might be, do you sense a different attitude in the defense industry, somebody that is working on defense stuff as opposed to commercial nondefense matters?

Mr. **HAUGH**. No; I would say what I notice in attitude, it would be one of embarrassment on the part of some employees working defense contracts.

Many times the worker that you were observing was obviously standing there with nothing to do. I am not saying that this was always the case, but it happened often. The guy would apologize, saying something like "I do not know what I am supposed to do so I am waiting here." Well you know, I guess the guy just is embarrassed so he makes those—those are the types of comments that we receive in cases where it was very, very obvious the guy had been standing there for a good length of time.

Senator **GRASSLEY**. Well, why would a defense contractor want more workers than he needs?

Let me also ask, would there be some incentive for him to operate in a manner that would seem to destroy a business in a competitive commercial environment?

Mr. **HAUGH**. I do not know if this is an intentional thing or if it is something that management, just through the magnitude of the thing, is really unaware that this is happening. I would not want to say that the management all the way up the line is aware that they have too many people.

I do not know. For example, we were not able to determine in many cases what happens to a report that measures performance on the floor, and then is submitted up the management chain. We were never able to determine who had the responsibility to respond to the deficiencies or how high up the management chain the report went before it was buried in someone's desk.

So I guess what I am saying is that someplace along the chain, someone should accept responsibility. We could not determine where or if that ever happened.

Senator **GRASSLEY**. Is that different than in commercial nondefense industry?

Mr. **HAUGH**. Oh, absolutely. There is a lot more visibility.

You know, if in commercial——

Senator **GRASSLEY**. Not really knowing who is in control? Is it that different than in the nondefense industry?

Mr. **HAUGH**. Absolutely. At least that was my finding in most industries.

Senator **GRASSLEY**. And you said you were only quoting from the standpoint of industries you knew something about.

Mr. **HAUGH**. That is right.

Senator **GRASSLEY**. But does that cover quite a lot of different companies or commodities?

Mr. **HAUGH**. A lot of different commodities, yes, sir. A lot of companies, all with different commodities, yes.

Senator **GRASSLEY**. But you are not talking about just a handful of companies?

Mr. **HAUGH**. Oh, no. Oh, no.

Senator **GRASSLEY**. You have had a wide range of experience dealing with these.

Would you say that the statements you have made have been—would be pretty encompassing of all those industries?

Mr. **HAUGH**. Of the industries I have looked at, yes.

Senator **GRASSLEY**. Yes.

And from that standpoint, there's a stark contrast between those industries and what you might know about in the nondefense area?

Mr. **Haugh**. With one exception.

I found one nondefense company who was building a jet who really were ineffective. And it was borne out. I think 3 months later we read that they were in trouble and just about to go out of business. And it was obivious that this was the one company out of the four that we looked that just did not have the same management programs in place that the others had as far as work measurement or related controls were concerned.

Senator **Grassley**. Mr. Hooper, do you think that the work management advocates a management philosophy that has made obsolete—that has been made obsolete by the forces of international competition?

Mr. **Hooper**. No.

Senator **Grassley**. That, too, is another point that DOD memos made against the legislation that we were proposing.

Mr. Hooper, would the Air Force ever consider penalizing a contractor for not achieving, for not achieving his own work standard? Or do you know of any instances where a contractor's labor performance level was considered to be unacceptable to the point where progress payments were withheld?

Mr. **Hooper**. I personally do not know of any situation where that occurred.

Senator **Grassley**. In other words, then, a contractor can take up to 10 or 20 times more than his own standard and the Air Force does not take any stern action to force corrective actions? Standards are not used to gage performance?

Mr. **Haugh**. Standards are used to gauge performance? I would think the actions would involve two things. One would be to use that performance data in pricing and negotiating a new contract. And that if the data was supportive, that some kinds of actions would be taken with the contractor.

I just do not know of any cases where it has gone as far as withholding progress payments.

Senator **Grassley**. A question to both of you. But I would ask Mr. Hooper to answer first.

How inefficient do you determine the defense industry to be?

Mr. **Hooper**. I do not believe I could answer that question. The data that we have seen collected over a period of time, if we were——

Senator **Grassley**. Could I ask you then just to respond? Maybe it was too general of a question. I will still leave the general approach to Mr. Haugh's answer. But in regard to your answer, you have done six productivity studies, and you have seen a lot of scrap and rework. From the standpoint of those studies, could you answer for me how inefficient you determine the defense industry to be?

Mr. **Hooper**. From those six productivity studies that we did, we concluded that in general the performance to standards was higher than it should have been, considering where most of these programs were at that particular point in time. And that far too many of them had too much scrap and rework considering again the program phase and where they were at.

I cannot quantify it for you.

Senator **Grassley**. Before I get to you, Mr. Haugh, do you have plans to go beyond those six studies?

Mr. **Hooper**. What we are trying to do now within Air Force Systems Command is institutionalize that process that was used together and present that data. The Air Force plant representatives that are located at 25 of our major contractors now on a regular basis, their commander presents that data up through the management chain to our commander in terms of how healthy the contractor's work measurement system is, how is the performance to standard, what is the trend of that, and what are the actions the contractors have taken to drive it down.

Additionally, our program managers are now required to again gather that kind of data and present the summary and actions up through the management chain. This is the same process that was essentially used during the productivity reviews, but now we are trying to institutionalize it versus ad hoc studies.

Senator **Grassley**. Well, let me suggest to you that if you need any help pursuing further such studies, let me assure you that from this Senator, and I think from this subcommittee, you will get all sorts of encouragement and help, if you need it.

Mr. **Hooper**. Thank you.

Senator **Grassley**. Mr. Haugh, would you answer my previous question on how inefficient do you determine the defense industry to be?

Mr. **Haugh**. Yes. I would like to proceed in answering the question with a statement that, you know, I do not want to really badmouth a lot of contractors out there who are performing satisfactorily and doing a good job.

So what I am talking about is again is the information that I have gathered personally, from personal observations, from reading reports, et cetera, there are some of our contractors out there who are doing excellent work, doing an excellent job, and I really would be remiss if I did not say that.

It has been my personal experience in reviewing contractor data that was made available to me on these surveys, and by personal observation, that I would say there is room for 2 to 30 improvement across the board.

Senator **Grassley**. So you think there is potential for great savings to the taxpayers if through work measurement and through other management tools changes are made?

Mr. **Haugh**. Yes, sir. I think that this is borne out by several studies which both the Air Force and I have copies.

Directing one to the Sagamore study for example, which was not an Air Force study, it was a joint industry-Air Force study, where it was reported that at, unit, 1,000 45 percent of the workforce was idle due to inefficient job assignment, overcrowding, part shortages, et cetera.

Now, I happen to have seen reports from that same contractor. It was obvious who the contractor was because no one else in the country had built a thousand units.

I asked people to try to "beg, borrow or steal" some reports for me, which they did. From his own computer prepared reports, this contractor was shown to be in the area of 43 percent efficient in those areas covered by the reports. That was his report, not my report, not my study.

Now, you are taking a report without any comments to it, I understand that. But we are talking about unit 1,000 plus, and still apparently accepting efficiency ratings of 43 percent. It was staggering to us.

It was another thing that helped sell Mil-STD 1567 this thing to the Project Ace Committee.

Senator **Grassley**. I have finished my questioning, but since you have been so helpful to us and so patient while I had so many questions, I would ask, before you leave the table, is there any one last thing either one of you would like to say in closing?

Mr. **Hooper**. Yes, sir. I would like to just add that work measurement is a very, very important tool, and we are certainly using it.

I just want to leave the committee with the one reminder, as they consider various numbers, various performance to standards, that we do make a distinction between the performance of an individual operator to standard which certainly should be approaching 100 percent on a regular basis versus looking at performance to standard at some aggregate level that include a lot of other factors. And that by looking at and making that distinction, hopefully we can clear up some of the confusion as to what is meant by you can achieve standard or not. Because I believe individually there is no reason not to achieve a standard.

But when all of these factors within a total factor are considered, all the things that have to occur by moving parts and people and things, and the production rates that we have to work with, that it should be at least kept in mind the difficulty in achieving standard at that aggregate level.

Senator **Grassley**. Mr. Haugh.

Mr. **Haugh**. It has been my experience that if you set a standard on a worker and if you give the worker the proper tooling and support that he needs to do the job then he will meet the standard if he wants to meet the standard, and is interested in doing a fair day's work.

I have yet to meet the man that wanted to stand around. Most people like to be kept busy; consequently they rarely quarrel with the standard. And, you know, I am seriously of the opinion that you really never ever really measure the worker; that you do in fact measure management's ability to give him the proper tools, equipment and work space, et cetera, to do the job.

I agree with Mr. Hooper that when you roll up an aggregate, you might have a deficiency that is not traceable to a cost center level but, you know, those things should be identified at the cost center level. If you wait for the problem to be identified at end item level, you will have lost any chance of going back on a timely basis, and identifying the real problem.

So, you know, I really disagree with those who would try to convince me that you can be effective, if you will, at cost center or worker level and be ineffective at wrap-up level. I do not understand that.

Second, I would like to comment, if I may, on learning curves.

I first got involved in learning curves in 1952 or 1954, I guess it was 1954. And there was very little information available at the time. It was something that had been developed during World War II when a lot of women were being brought into the workforce, and we were trying to build a lot of airplanes in different plants all around the country.

This 1,000 number is foreign to me. I have never been able to find out where it came from. I have yet to find an expert, including R.G. Carlson at USC, who is acknowledged to be one of the experts in learning curves in the country, that totally embrace this 1,000th-unit theory.

Senator **Grassley**. I hope your comments will put that myth to rest.

Mr. **Haugh**. Do you want me to continue?

Senator **Grassley**. You can continue but I just wanted to make that point right now.

Mr. **Haugh**. Well, OK.

Well, you know, it is just simple. If I give you the job of assembling this microphone here, and I tell you that you are going to assemble that every day for the next 6 months, that what you are saying if you tell me that there is a thousand of these things, so I understand it, if you are saying essentially that you are going to have to take that line apart and set on that microphone for 6 months every day before you know how to do it, there is no way you can convince me of that.

I was at GE at Fort Worth on the F-16 program with preproduction review team. At that time, the Chief of Industrial Engineering commented they (GD) were contemplating the use of the 1,000th unit as a basis for learning the curve calculations.

I explained to him that I did not accept that, in that it had no basis in fact. He said, well, that is what industry has found in the past to be true.

I told him at that time that I would make a deal with him. We would down on the line, talk to a foreman, and if the foreman agreed with what he was saying, I would agree to the 1,000-unit deal. If not, he would go along with me and we would not use a thousand unit as the target unit for achieving standard.

We went down, I chose landing gear installation because I was familiar with landing gear installation more so than a lot of other things. We asked the foreman how long would it take you to train these people, or how long has it taken you to train these people—they were on their third preproduction airplane—how long do you expect it will take these people to learn to do this job effectively? And he thought awhile and he said if they can't do it in 15 or 20 units, I would fire them.

So, now you are talking 15 or 20 units, which I really believe, because I have installed a landing gear in many airplanes. And I believe that if you have installed your 20th unit, you had better know what you are doing or they should get rid of you and get someone else in it because, you know, it really is not all that difficult.

Now, if you want to tell me that there are certain things that you might want to use this 1,000 unit on, I might consider that. But to use it across the board I think is really ridiculous, and a management crutch. I think it is just unfair, to the Government, that is.

Senator **Grassley**. Well, let me say once again I am glad that the Department of Defense is here to hear what you had to say. And I want to say thank you very much for coming.

Yesterday, I said in my opening statement that I have taken certain positions. Other people, particularly within Defense, have taken positions against my point of view. And we have opened this all up for a public discussion. I think you two have contributed a great deal to that public discussion. Somewhere along the line, when all the facts and points of view are laid out on the table, you know, then we will make a decision as we do in this society of ours.

Thank you very much.

I think we will start even though my staff is momentarily out. I would say welcome, very much so; thank you for coming, thank you for responding to my invitation. I would also, since we do not have the names of your colleagues, would you introduce them to us, please.

STATEMENT OF A PANEL CONSISTING OF MARY ANN GILLEECE, DEPUTY UNDER SECRETARY, ACQUISITION MANAGEMENT, DEPARTMENT OF DEFENSE, ACCOMPANIED BY DICK STIMSON, DIRECTOR FOR INDUSTRIAL PRODUCTIVITY; JOHN KENDIG, DIRECTOR OF COST PRICING AND FINANCE

Ms. **Gilleece**. Yes, Mr. Chairman; and it is indeed a pleasure to be here. This is an area, as you know, of major concern within the department. The Secretary himself is very personally involved in this.

I have accompanying me today Dr. Dick Stimson, who is the Director in my office for Industrial Productivity, and Mr. Jack Kendig, who is also from my office, the Director of Cost Pricing and Finance

Did you wish to hear backgrounds of people as you have indicated to the prior witnesses?

Senator **Grassley**. Yes, please. Yes.

Ms. **Gilleece**. As you will probably recognize——

Senator **Grassley**. On your part as well as on the part of your colleagues.

Ms. **Gilleece**. OK. As you would probably recognize, and as you know from prior hearings before you, I am an attorney with a post-law degree in government contract law.

Dr. Stimson.

Dr. **Stimson**. Good morning. I'm Dr. Richard Stimson. As Mary Ann pointed out, my responsibility is industrial productivity covering a broad facet of factors affecting productivity in the defense industry, including quality and manufacturing. As far as my education is concerned, I have an engineering degree. I'm a registered professional engineer in the State of Ohio. I have a master's of business administration and a doctorate in business administration with a specialty in management.

I have 29 years of service to the U.S. Government, having previously worked with the Air Force, Navy, DLA, and the GSA. I have spent some time on the staff of the President's science adviser and with the Office of Federal Management Policy.

At the present time I am concerned with and am the manager of a nationwide conference addressing quality and productivity. I was a member of the private sector conference studying quality problems for the White House Conference on Productivity.

I have worked as a blue collar worker in the factory. I have worked as an inspector in the factory. I have worked as a project engineer for one of the major—the major—companies in the United States.

One of my responsibilities in the position was working the problems between engineering and the factory. For the last 15 years, I have taught in a local university at the graduate level on the subject of management.

Senator **Grassley**. Is your engineering degree industrial?

Dr. **Stimson**. No, it is mechanical engineering.

Senator **Grassley**. OK. Your factory experience, or, I should say, however you termed your total factory experience, how many years is that?

Dr. **Stimson**. Six years in industry.

Senator **Grassley**. Six years.

Mr. **Kendig**. My name is John Kendig. I am a graduate accountant and a certified public accountant. I worked for 17 years as a contract auditor with DCAA and for the past 8 years I have been in the Office of the Secretary of Defense in my present position as Director of Cost Pricing and Finance.

Senator **Grassley**. Thank you. Ms. Gilleece.

Ms. **Gilleece**. Mr. Chairman, it is indeed a pleasure for you to provide us the opportunity to clarify, if you will, the position of the Department of Defense, and certainly, the Office of the Secretary of Defense, in regard to work measurement.

As has been stated, one of the key issues in this area is military standard 1567A. In fact, that is a Department of Defense standard which we absolutely support. It is certainly one of the tools that we use toward productivity an quality in the defense acquisition environment. The greater use of industrial engineering techniques such as this play a key role in the context of our focusing on improvement in productivity and quality.

This standard was published, as I know you are aware, in 1983, as a fully coordinated military standard. Since that time, we have been working on an application guide, which we view as important to its broader use and acceptance.

The purpose of this guide is to provide noncontractural information on when and how to use the military standard. However, we expect a contractor to use these techniques, and to use them effectively, whether or not we impose a military standard on this subject.

The application guide has been directed to the Air Force for their coordination of the military positions. The Air Force informs me that they specifically designated Air Force Systems Command as the command responsible for that coordination.

You asked me to discuss the two memos attached to your second letter to me and I certainly will do that. Let me first mention to you that they are both specifically focused on the amendment.

The amendment raises some concerns, and it raises concerns because of the interpretation that may occur as a result, and the consequent implementation. First of all, by way of background, on June 3—and I certainly will provide all referenced documents for the record—as I would, by the way, Mr. Chairman, ask that my full statement be provided and be accepted into the record. I will not read the statement.

Senator **Grassley**. Automatically.

Ms. **Gilleece**. OK. On June 3, we received a request from our legislative liaison office specifically asking us to provide to them our opinion of the Office of Acquisition Management on the amendment that is on work measurement.

We did that June 7. That information, it is my understanding, was provided to Capitol Hill by the Office of Legislative Affairs.

We then also received a request on a Friday, that we attend a meeting on Monday, on Capitol Hill, specifically on this matter.

Dr. Stimson and members of his staff worked over the weekend and put together the point paper which is called "Impact of Provisions of Amendment No. 244 of S. 7187." We were responding in that particular way to Capitol Hill. I will also mention to you that at the same time, it is my understanding, that the Air Force also provided a paper, contiguous with our paper, and in pertinent part, it specifically states, "OSD Position: Same as Air Force." I will provide that, as I indicated, for the record.

COST AND PRICE MANAGEMENT IN DEFENSE PROCUREMENT

Senate: Adds requirement for new cost tracking/management system for all of DOD. In summary, the following will be required for all contracts over $100K (estimated to be over 5000 contracts per year).

1. A breakdown of cost by functional category (labor, material, indirect, G&A, etc.) with subcategory for recurring and nonrecurring.

2. Against this breakdown, a listing of proposed, negotiated, and actual costs. In addition, work measurement standards (should take times) will be provided by the same category.

3. A bill of labor which breaks the labor breakdown into subcategories is also required.

4. A priced bill of material is also required broken down in the same manner as 3 above.

5. This documentation requirement is not a one time effort on the contracts. It must be maintained (to add actuals as they occur, to reflect engineering changes, to reflect changes in work measurement standards).

There is a bail out provision in the legislation which says that if the data is not being currently maintained in this form on the date of enactment that compliance is not necessary. To the best of our knowledge no contractor currently maintains the data in this form. However, we would expect that we will be forced to comply with the provisions.

House: Same as Senate except that it only applies to contracts that require cost and pricing data.

Recommended AF Position: We oppose the proposed legislation; however, it doesn't appear that the amendment will be open for significant changes in conference since substantially the same versions passed in both the House and Senate.

The impact on current Air Force contracting and manufacturing workforce is massive. It is often difficult to negotiate the detailed breakdown of contract cost. This cost and price management system will duplicate existing systems (C/SCSC for example). We estimate that a significant portion of all Air Force Pricing and Industrial Engineering personnel will have to be committed to the documentation requirement on a full time basis. This is in addition to the additional resources it will take to negotiate each category and type of cost on a contract.

In order for this system to be useful to the Air Force we would have to force a fundamental change in cost reporting. This would have to be the primary cost management tool thus replacing C/SCSC. Implementation will require significant planning, instruction and specialized training. We will have to start now to develop this system to implement in FY86 since the negotiations for the FY86 quantities are already underway.

OSD Position: Same as Air Force.

I am also informed orally, by the Army and the Navy, that they also have some significant problems with the potential interpretation and implementation of the provision that is, as you know, subject to conference right now, as part of the authorization bill.

Let me mention to you, if I might, some of the concerns that we have. Having, by the way, no answers to some of these concerns, there continues to be questions with where the legislation is directed.

The legislation does not clearly identify the type of labor which it is presumably intended to track. In other words, is it direct manufacturing labor? There are questions as to amount and type of data to be recorded and reported, and subcontractor applicability.

A key feature of the amendment would require DOD to cause to be recorded on covered contracts the contractor's proposed and negotiated cost and pricing data.

We already require prime contractors to submit their proposals in a manner consistent with this amendment. However, in the discussion associated with the introduction of the amendment, it was stated that this information is presently gathered by the services, and therefore, would not generate new information or needless paperwork.

The statement is not accurate because the services do not in fact gather incurred costs on defense contracts. Incurred costs are retained as a part of the contractor financial records and are available to program officers, contracting officers, auditors, et cetera, as needed.

I want to emphasize that DOD has no central management information system which accumulates incurred costs. We understand the amendment to require data be gathered and recorded by the Department in a manner which would permit, on demand, a report to Congress for the purpose of comparing proposed, negotiated, and actual costs for each element of cost for all covered contracts.

If our understanding is correct, then the amendment will require the Department to expend millions of dollars to develop and maintain such a reporting system.

An important feature of the amendment requires recording and tracking of the standard hour content of labor as a part of the bill of labor.

The amendment explicitly states that standard hours of work content obtained from predetermined time standard systems are "should take" times. The DOD manufacturing environment is frequently different from the production circumstances from which predetermined time standards are derived, namely, very repetitive operations and high production volumes, which even the previous witness has discussed. DOD production quantities are frequently small, products often technically sophisticated, and engineering changes frequently occur.

Significant variations in actual times from those suggested by predetermined time standards can be expected in even the most efficient manufacturing operation, particularly early in a program.

To imply that standard hours are "should take" times, as I would define the latter term, may in fact be inaccurate.

Mr. Chairman, I would also mention that we have had conversations with our general counsel's office. I asked them to take a look at the legislation because I was also concerned that maybe they, as our legal representative, would be able to interpret and cause us to thus implement the legislation in a way which was more specific than we saw it.

They raised a number of questions and imparted onto us confusion that they would have in helping to advise us in our implementation procedure.

For example, let me give you just a few of the things that they brought up. In a section that discusses the covered contracts, it specifically mentioned 2306 of chapter 137. That is not specifically the cost and pricing data section.

The cost and pricing data section is 2306(f). General counsel's office raises a question, did they mean the entire section? Or did they simply mean section (f)? There was also a question of subcontractor applicability.

2306(f) covers contracts over $100,000, not only prime contracts, but also subcontracts within the category of that section, and also covers modifications that are over $100,000.

The question is, did the committee intend for that to be the case? Also, you mention in section 2A of the legislation, "associate contractors." We are unaware of a definition as to what an associate contractor is.

There also is a question about the applicability in total of this particular legislation. If we do not have the information at the date of enactment, as it states in one of the last paragraphs of the legislation, does that mean that contractors are not going to have to maintain that information? Or does it mean that we should then start requiring them to do so?

Does it apply to existing contracts? Do we need to go in and renegotiate our already existing contracts, to have that information provided to us on the contracts in effect?

If so, do we then renegotiate? What consideration do we give the contractor at that point for now providing us information that was not the subject of the original contract? Contractors, as I indicated before—and general counsel's office also raises this point—do not necessarily have all this information. If they do, do they have it in the format specifically defined in the legislation?

A review, I might add, of the discussion in the other body on this when the Committee of the Whole was considering the legislation, also indicated some degree of uncertainty.

There was, for example, indication that they believed that the legislation only covered major systems and only covered matters over $100 million.

Since, as I indicated, 2306(f) covers contracts over $100,000, there was some question as to when this particular amendment should apply.

Let me conclude by saying that what we are concerned about is making sure that we use a very valid technique in an appropriate fashion.

We are concerned that the clarification of the legislation needs to be specifically defined. We in DOD recognize that intent is sometimes different than the language of the legislation, and that in the case of any conflicts, the language of the legislation is the controlling factor.

Mr. Chairman, I might offer this: We have not been asked, specifically by the Armed Services Committees, and we certainly would not respond unless we were—but if you, Mr. Chairman, would make arrangements for us, as well as your staff, to meet with the Armed Services Committee as they write the language of the statement of managers, and if that statement of managers language were specific, then we would know how we were to implement it.

The last thing that we wish to do is to implement the language in a way inconsistent with your desires. What I think we need—and General Counsel's Office also brings this to our attention—is specific implementation guidance from the authorization committees as they report out the authorization bill, so that if it were challenged in court, we have a position based upon a record.

And these hearings, Mr. Chairman, certainly will support that record, and therefore, we very much in the Department support your having these hearings, as we stated, by the way, in the June 7 memo. We had suggested that hearings were necessary. Thank you, Mr. Chairman.

[The statement follows:]

Prepared Statement of Mary Ann Gilleece

MR. CHAIRMAN, MEMBERS OF THE SUBCOMMITTEE:

I APPRECIATE THE OPPORTUNITY TO PROVIDE THE VIEWS OF THE OFFICE OF THE SECRETARY OF DEFENSE REGARDING THE PROPER ROLE AND USE OF TIME STANDARDS AND WORK MEASUREMENT IN DEFENSE CONTRACTING. IN MY TESTIMONY I WILL DISCUSS OVERALL DOD POLICY AS IT RELATES TO THIS GENERAL AREA. I WILL ALSO PROVIDE COMMENTS ON AMENDMENTS TO THE FY 86 DOD AUTHORIZATION BILL ENTITLED, "COST AND PRICE MANAGEMENT," RECENTLY PASSED IN THE SENATE AND THE HOUSE.

THE DEPARTMENT OF DEFENSE HAS A VARIETY OF ACTIVITIES UNDER WAY AIMED AT IMPROVING PRODUCTIVITY AND QUALITY IN THE DEFENSE ACQUISITION ENVIRONMENT. THEY INCLUDE OUR ENHANCED MANAGEMENT ATTENTION TO AND OVERALL EMPHASIS ON IMPROVED PRODUCTIVITY AND QUALITY, OUR FOCUS ON PRODUCIBILITY AND THE DESIGN OF OUR SYSTEMS AND EQUIPMENT FOR EASE IN MANUFACTURING, GREATER CONSIDERATION OF PRODUCTION AND MANUFACTURING ASPECTS DURING THE SYSTEM ACQUISITION REVIEW AND SOURCE SELECTION PROCESSES, OUR EMPHASIS ON THE DESIRABILITY OF FACTORY MODERNIZATION AND GREATER USE OF COMPUTER INTEGRATED MANUFACTURING SYSTEMS, THE RECOGNITION OF THE NEED FOR GREATER WORKER TRAINING AND MOTIVATION, THE DEVELOPMENT AND PRACTICAL USE OF PRODUCTIVITY MEASUREMENT INDICES, AND ENSURING THAT CONTRACT REQUIREMENTS DO NOT ADD COSTS IN EXCESS OF BENEFITS. GREATER AWARENESS OF CONTRACTOR RESPONSIBILITIES AND ACCOUNTABILITY ARE THE CORNERSTONES OF OUR IMPROVEMENT EFFORTS. INCREASED COMPETITION AND USE OF WARRANTIES ARE IMPORTANT FACTORS IN OUR PLANS. OVERHEAD COSTS ARE BEING SCRUTINIZED, WE HAVE INCREASED AUDITING AND CONTRACT SURVEILLANCE ACTIVITIES, WE HAVE EXPOSED WASTE AND INEFFICIENCIES, AND WE HAVE NOT HESITATED TO ACT AS A TOUGH CUSTOMER WHEN THE SITUATION WARRANTS. WE BELIEVE OUR ACTIONS ARE CREATING THE CLIMATE NECESSARY TO ENSURE CONTRACTORS ARE OPERATING EFFICIENTLY.

THE GREATER USE OF INDUSTRIAL ENGINEERING TECHNIQUES SUCH AS WORK MEASUREMENT PLAYS A SIGNIFICANT ROLE IN THIS CONTEXT. IN 1983, WE PUBLISHED MIL-STD-1567A, "WORK MEASUREMENT," AS A FULLY-COORDINATED MILITARY STANDARD. SINCE THEN WE HAVE BEEN WORKING ON AN APPLICATION GUIDE WHICH WE VIEW AS IMPORTANT TO ITS BROADER USE AND ACCEPTANCE. THE PURPOSE OF THIS GUIDANCE IS TO PROVIDE

NON-CONTRACTUAL INFORMATION ON WHEN AND HOW TO USE THE MILITARY STANDARD. IT IS INTENDED TO PROMOTE CONSISTENCY IN APPLICATION AND INTERPRETATION OF REQUIREMENTS. WE HAVE MADE SUBSTANTIAL PROGRESS IN OUR EFFORTS, BUT SHOULD NOTE THAT EXPERIENCE USING THE STANDARD CONTRACTUALLY IS LIMITED, PARTICULARLY OUTSIDE OF THE AIR FORCE. IT TAKES TIME TO PROPERLY IMPLEMENT A STANDARD OF THIS TYPE.

WHILE NO ONE WILL DISPUTE THE VALUE OF INDUSTRIAL ENGINEERING, WORK MEASUREMENT, AND TIME STANDARDS, PERMIT ME TO ADD A FEW WORDS OF CAUTION. WE EXPECT A CONTRACTOR TO USE THESE TECHNIQUES, AND TO USE THEM EFFECTIVELY, WHETHER OR NOT WE IMPOSE A MILITARY STANDARD ON THE SUBJECT. THE MILITARY STANDARD ON WORK MEASUREMENT GIVES US SOME EXTRA CONTROL IN AND VISIBILITY INTO THE AREA, BUT IT WILL NOT BE NEEDED IN EVERY ACQUISITION CIRCUMSTANCE--OR AT LEAST THE REQUIREMENTS MAY BE SUBJECT TO ADJUSTMENT TO MAKE ITS APPLICATION COST-EFFECTIVE. WE ARE NOT TRYING TO MANAGE A CONTRACTOR'S FACILITY FOR HIM AT A MICRO-LEVEL; WE DO NOT WANT TO GENERATE PAPERWORK AND DOCUMENTATION THAT CAN COST MORE THAN THE BENEFITS THEY YIELD; WE DO NOT WANT TO FOCUS ON DIRECT LABOR (POSSIBLY AS LOW AS 10% OF ACQUISITION COSTS) WHILE FORGETTING OTHER IMPORTANT AREAS; WE DO NOT WANT TO GENERATE SINGLE STATISTICS THAT CAN BE DISTORTED, ERRONEOUSLY INTERPRETED, SUBOPTIMIZED, OR TAKEN OUT OF CONTEXT; WE DO NOT WANT TO EMPHASIZE PRODUCTION QUANTITY OVER QUALITY; AND WE DO NOT WANT TO DE-MOTIVATE WORKERS OR MANAGEMENT.

I AM CONFIDENT THESE AND ANY OTHER IMPEDIMENTS CAN BE OVERCOME THROUGH PROPER IMPLEMENTATION. THAT'S WHY WE ARE PROMOTING GREATER ATTENTION TO INDUSTRIAL ENGINEERING TECHNIQUES AND WORK MEASUREMENT --IN A CONSTRUCTIVE MANNER--TO REDUCE OVERALL DOD ACQUISITION COSTS. THEIR MOST SIGNIFICANT BENEFIT SHOULD BE TO DIRECTLY HELP A CONTRACTOR IMPROVE HIS OWN OPERATIONS. WE ALSO EXPECT THEM TO OFFER SOME DEGREE OF VISIBILITY TO THE DOD TO ASSIST US IN CARRYING OUT OUR RESPONSIBILITIES. WE ARE ADVOCATING INCREASED USE OF MIL-STD-1567A--BUT IN A PRUDENT FASHION.

LET ME NOW ADDRESS SOME CONCERNS WE HAVE WITH THE IMPENDING LEGISLATION I MENTIONED EARLIER. THESE ARE DISCUSSED IN AN INTERNAL JUNE 7TH DOD MEMORANDUM FROM MY OFFICE TO THE ASSISTANT SECRETARY OF DEFENSE FOR LEGISLATIVE AFFAIRS. THIS CORRESPONDENCE WAS IN

RESPONSE TO THEIR MEMORANDUM OF JUNE 3RD, WHICH IN TURN WAS BASED ON A REQUEST BY THE HOUSE ARMED SERVICES COMMITTEE (HASC) STAFF FOR AN ASSESSMENT OF THE AMENDMENT. OUR POINT OF STRONGEST EMPHASIS WAS THE BELIEF THAT AN AMENDMENT OF THIS MAGNITUDE SHOULD NOT BE ADOPTED WITHOUT EXTENSIVE CONGRESSIONAL HEARINGS. WE ALSO EXPRESSED THESE CONCERNS IN A MEETING WHICH WAS CONVENED BY THE HASC STAFF. MR. CHAIRMAN, AMONG THOSE PRESENT AT THAT MEETING WERE MEMBERS OF YOUR STAFF. THE POINT PAPER OF JUNE 17TH WAS PREPARED AND USED BY MY STAFF FOR DISCUSSION PURPOSES AT THAT MEETING. OUR BIGGEST APPREHENSION WAS AND IS THAT A HURRIED APPROACH TO THE AREA MAY NOT PERMIT UNDERSTANDING OF ALL OF THE RAMIFICATIONS. THE REMAINING PORTION OF MY REMARKS WILL EXPLAIN AND ELABORATE ON THE SUBSTANCE OF OUR EARLIER ASSESSMENT OF THE LEGISLATION.

IN OUR JUDGMENT, MANY PROVISIONS OF THE LEGISLATION ARE AMBIGUOUS AND SUBJECT TO MISINTERPRETATION. THERE IS UNCERTAINTY AS TO THE TYPES OF CONTRACTS TO WHICH IT APPLIES. THE LEGISLATION DOES NOT CLEARLY IDENTIFY THE TYPE OF LABOR WHICH IT IS PRESUMABLY INTENDED TO TRACK--I.E., DIRECT MANUFACTURING LABOR. THERE ARE QUESTIONS AS TO AMOUNT AND TYPE OF DATA TO BE RECORDED AND REPORTED AND SUBCONTRACTOR APPLICABILITY. TO THE EXTENT CLARIFICATION IN THESE AREAS CAN BE PROVIDED IN THE CONFERENCE REPORT OR DURING THESE HEARINGS, DOD IMPLEMENTATION WILL BE GREATLY FACILITATED. WE IN THE DOD RECOGNIZE, HOWEVER, THAT INTENT IS SOMETIMES DIFFERENT THAN THE LANGUAGE OF LEGISLATION--AND THAT, IN THE CASE OF ANY CONFLICTS, THE LANGUAGE OF THE LEGISLATION IS THE CONTROLLING FACTOR.

IT IS OUR PERCEPTION, PERHAPS INCORRECT, THAT THE LEGISLATION IS PREDICATED ON THE BELIEFS THAT THE DATA REQUESTED IS READILY AVAILABLE, EASILY SUMMARIZED, ALWAYS NON-PROPRIETARY IN NATURE, EASILY UNDERSTOOD AND INTERPRETED, AND IS BEING WITHHELD BY DOD OFFICIALS. THESE ARE SIMPLY NOT THE FACTS.

A KEY FEATURE OF THE AMENDMENT WOULD REQUIRE DOD TO CAUSE TO BE RECORDED ON COVERED CONTRACTS THE CONTRACTOR'S PROPOSED AND NEGOTIATED COST AND PRICING DATA. THE APPROPRIATE CATEGORIES INCLUDE LABOR COSTS, MATERIAL COSTS, SUBCONTRACT COSTS, OVERHEAD COSTS, GENERAL AND ADMINSTRATIVE COSTS, FEE OR PROFIT, RECURRING COSTS, AND NONRECURRING COSTS. THE AMENDMENT ALSO WOULD REQUIRE

RECORDING OF INCURRED COSTS IN THE SAME MANNER AS NEGOTIATED AND PROPOSED.

I BELIEVE IT WOULD BE VERY HELPFUL TO EXPLAIN HOW CONTRACT COSTS ARE CURRENTLY BEING RECORDED BY THE CONTRACTOR AND WHAT TYPE OF RECORDS ARE BEING MAINTAINED BY THE GOVERNMENT. IN THIS WAY, WE CAN REVIEW THE ADMINISTRATIVE IMPACT OF THIS PROVISION AND ASSESS THE VALUE ADDED TO OUR ABILITY TO MANAGE DEFENSE PROCUREMENT.

WE ALREADY REQUIRE PRIME CONTRACTORS TO SUBMIT THEIR PROPOSALS IN A MANNER CONSISTENT WITH THIS AMENDMENT. THE CONTRACTOR SUBMITS COST OR PRICING DATA BY MAJOR COST ELEMENT AND CERTIFIES THAT SUCH COSTS ARE CURRENT, ACCURATE, AND COMPLETE IN ACCORDANCE WITH THE REQUIREMENTS OF THE "TRUTH IN NEGOTIATIONS ACT." HOWEVER, CONTRACTORS ARE NOT NECESSARILY REQUIRED TO GROUP COSTS INTO RECURRING/NONRECURRING. IN ADDITION, THE FEDERAL ACQUISITION REGULATIONS REQUIRE CONTRACTING OFFICERS TO MAKE A FORMAL WRITTEN RECORD OF THE RESULTS OF PRICE NEGOTIATIONS BY EACH ELEMENT OF COST. FINALLY, IN ACCORDANCE WITH THE PROMULGATIONS OF THE COST ACCOUNTING STANDARDS BOARD, CONTRACTORS ARE REQUIRED TO RECORD THEIR COST IN A MANNER CONSISTENT WITH THE MANNER IN WHICH THEY PROPOSED THE COST. THUS IF THE AMENDMENT ONLY REQUIRES THAT DOD CAUSE THIS INFORMATION BE RECORDED, THEN THE DEPARTMENT OF DEFENSE IS ALREADY IN COMPLIANCE WITH THIS ASPECT.

HOWEVER, IN THE DISCUSSION ASSOCIATED WITH THE INTRODUCTION OF THE AMENDMENT IT WAS STATED THAT THIS INFORMATION IS PRESENTLY GATHERED BY THE SERVICES AND, THEREFORE, WOULD NOT GENERATE NEW INFORMATION OR NEEDLESS PAPERWORK. THIS STATEMENT IS NOT ACCURATE BECAUSE THE SERVICES DO NOT GATHER INCURRED COSTS ON DEFENSE CONTRACTS. INCURRED COSTS ARE RETAINED AS PART OF THE CONTRACTOR FINANCIAL RECORDS AND ARE AVAILABLE TO PROGRAM OFFICERS, CONTRACTING OFFICERS, AUDITORS, ETC., AS NEEDED. I WANT TO EMPHASIZE THAT DOD HAS NO CENTRAL MANAGEMENT INFORMATION SYSTEM WHICH ACCUMULATES INCURRED COSTS.

IT HAS FURTHER BEEN SAID THAT THE AMENDMENT WOULD SIMPLY REQUIRE THAT INFORMATION OF THIS DETAILED LEVEL BE SYSTEMATIZED BY THE SERVICES AND MADE AVAILABLE FOR CONGRESSIONAL REVIEW. BASED ON THESE REMARKS, WE UNDERSTAND THE AMENDMENT TO REQUIRE DATA BE

GATHERED AND RECORDED BY THE DEPARTMENT IN A MANNER WHICH WOULD PERMIT, ON DEMAND, A REPORT TO CONGRESS FOR THE PURPOSE OF COMPARING PROPOSED, NEGOTIATED, AND ACTUAL COSTS FOR EACH ELEMENT OF COST FOR ALL COVERED CONTRACTS. IN ADDITION, THE AMENDMENT AS WRITTEN APPEARS TO BE APPLICABLE TO ALL CURRENT AS WELL AS FUTURE CONTRACTS. IF OUR UNDERSTANDING IS CORRECT, THEN THE AMENDMENT WILL REQUIRE THE DEPARTMENT TO EXPEND MILLIONS OF DOLLARS TO DEVELOP AND MAINTAIN SUCH A REPORTING SYSTEM.

LET ME EXPLAIN WHY WE BELIEVE THE SYSTEM TO BE VERY EXPENSIVE TO ESTABLISH AND MAINTAIN. UNDER CURRENT PROCEDURES, CONTRACTORS ARE REQUIRED TO FURNISH THEIR PROPOSALS BY ELEMENT OF COST CONSISTENT WITH THE MANNER IN WHICH THEY RECORD THEIR ACTUAL COST. DURING NEGOTIATIONS THE CONTRACTORS AND OUR CONTRACTING OFFICERS ARRIVE AT AN AGREED PRICE BUT DO NOT ATTEMPT TO ARRIVE AT AGREEMENT ON EACH AND EVERY ELEMENT OF COST. FOR OUR RECORDS, HOWEVER, THE CONTRACTING OFFICER DOES RECORD THE ELEMENT BY ELEMENT COSTS THAT HE CONSIDERED ACCEPTABLE IN ARRIVING AT THE FINAL PRICE. IF THERE WERE NEVER ANY CHANGES OR ADJUSTMENTS TO THESE NEGOTIATED CONTRACTS THEN IT WOULD BE A RELATIVELY SIMPLE MATTER TO REPORT THE CONTRACTOR'S PROPOSAL, THE CONTRACTING OFFICER'S UNDERSTANDING OF THE ELEMENT BY ELEMENT NEGOTIATED AMOUNTS, AND FINALLY THE COSTS AS RECORDED BY THE CONTRACTORS ON AN ELEMENT BY ELEMENT BASIS. HOWEVER, MOST CONTRACTS ARE MODIFIED TO SOME EXTENT. EACH OF THESE MODIFICATIONS REQUIRES A CONTRACTOR PROPOSAL AND A NEGOTIATION WHICH EFFECTS THE CONTRACT PRICE. AT THE CONCLUSION OF THE NEGOTIATION, WE ADJUST OUR RECORDS TO REFLECT THE INCREASE OR DECREASE IN THE CONTRACT PRICE. WE DO NOT ATTEMPT TO KEEP ANY RECORD OF THE IMPACT OF THESE MODIFICATIONS ON EACH ELEMENT OF COST. IN ADDITION, ALTHOUGH CONTRACTORS RECORD THEIR COSTS BY ELEMENT, NO ATTEMPT IS MADE TO ACCOUNT FOR THE COSTS ASSOCIATED WITH MODIFICATIONS SEPARATE FROM THE COSTS RECORDED FOR THE BASIC WORK ORIGINALLY NEGOTIATED. IN FACT, SUCH A RECORD, IN MOST CASES, WOULD BE IMPOSSIBLE. FOR EXAMPLE, WHEN A MODIFICATION CAUSES AN ADJUSTMENT IN THE MANUFACTURING PROCESS THAT REQUIRES A DRILL PRESS OPERATOR TO MAKE FOUR HOLES IN A SHEET OF METAL INSTEAD OF THREE, IT IS OBVIOUS IT WILL TAKE MORE TIME. HOWEVER, IT IS NOT POSSIBLE TO MEASURE AND ASSIGN THE ACTUAL TIME ADDED TO THE PROCESS AND RECORD IT AGAINST A SEPARATE

WORK ORDER. IN ORDER TO PRESENT THE COMPARATIVE DATA REQUIRED BY THE AMENDMENT IT WILL BE NECESSARY TO CHANGE OUR PROCEDURES TO REQUIRE THAT WE ADJUST THE NEGOTIATED COST, ELEMENT BY ELEMENT, AT THE CLOSE OF EACH NEGOTIATION INSTEAD OF JUST ADJUSTING THE TOTAL PRICE AS WE DO NOW. IN ADDITION, IN ORDER TO DEVELOP THE REQUIRED DATA ON CURRENT OPEN CONTRACTS WE WILL HAVE TO REVIEW HUNDREDS OF THOUSANDS OF CONTRACT ACTIONS THAT HAVE OCCURRED OVER THE PAST FOUR OR FIVE YEARS TO DETERMINE WHICH ONES ARE SUBJECT TO THE REQUIREMENTS OF THE AMENDMENT. AFTER THIS EXTREMELY BURDENSOME AND EXPENSIVE TASK IS ACCOMPLISHED, WE WOULD THEN PROCEED TO ACCUMULATE AND COLLATE ALL DOCUMENTATION RELATING TO THE CONTRACT NEGOTIATIONS, I.E., THE BASIC NEGOTIATION AND ALL SUBSEQUENT NEGOTIATIONS UNDER EACH CONTRACT. THESE EFFORTS ARE REQUIRED IN ORDER TO DEVELOP DATA COMPARABLE WITH INCURRED COSTS.

FOR REASONS SUCH AS THE ABOVE, WE RECOMMENDED THAT THE AMENDMENT BE THE SUBJECT OF CONGRESSIONAL HEARINGS BEFORE ENACTMENT. WE ARE HOPEFUL THAT THIS HEARING OR ANY FUTURE HEARING WILL PROVIDE ANSWERS TO THE FOLLOWING QUESTIONS WHICH MAY EITHER MINIMIZE OR EXPAND THE SCOPE OF THE EFFORT REQUIRED UNDER THE AMENDMENT, AND THEREFORE SUBSTANTIALLY IMPACT ON THE COST OF ITS IMPLEMENTATION.

IS THE AMENDMENT APPLICABLE TO CURRENT CONTRACTS?

IS THE AMENDMENT APPLICABLE TO BOTH PRIME CONTRACTS AND SUBCONTRACTS?

IS THE AMENDMENT APPLICABLE TO NEGOTIATED CONTRACT AMENDMENTS ASSOCIATED WITH CONTRACTS THAT WERE ORIGINALLY AWARDED ON THE BASIS OF SEALED BIDS OR TO ANY OTHER AWARD PROCEDURE THAT WAS NOT SUBJECT TO THE "TRUTH IN NEGOTIATIONS ACT?"

AN IMPORTANT FEATURE OF THE AMENDMENT REQUIRES RECORDING AND TRACKING OF THE STANDARD HOUR CONTENT OF LABOR AS PART OF A BILL OF LABOR. THE AMENDMENT EXPLICITLY STATES THAT STANDARD HOURS OF WORK CONTENT OBTAINED FROM PREDETERMINED TIME STANDARD SYSTEMS ARE "SHOULD-TAKE TIMES." THE DOD MANUFACTURING ENVIRONMENT IS FREQUENTLY DIFFERENT FROM THE PRODUCTION CIRCUMSTANCES FROM WHICH PREDETERMINED TIME STANDARDS ARE DERIVED--NAMELY VERY REPETITIVE OPERATIONS AND HIGH PRODUCTION VOLUMES. DOD PRODUCTION QUANTITIES ARE FREQUENTLY SMALL, PRODUCTS ARE OFTEN TECHNICALLY SOPHISTICATED, AND ENGINEERING CHANGES FREQUENTLY OCCUR. SIGNIFICANT VARIATIONS

IN ACTUAL TIMES FROM THOSE SUGGESTED BY PREDETERMINED TIME STANDARDS CAN BE EXPECTED IN EVEN THE MOST EFFICIENT MANUFACTURING OPERATION, PARTICULARLY EARLY IN A PROGRAM. TO IMPLY THAT STANDARD HOURS ARE "SHOULD TAKE TIMES" (AS I WOULD DEFINE THE LATTER TERM) IS INACCURATE. WE DO NOT WANT TO INADVERTENTLY CONTRIBUTE TO THE ERRONEOUS VIEWPOINT THAT THE DOD ACQUISITION PROCESS IS REPLETE WITH INEFFICIENCY AND WASTE. THE "HORROR STORIES" NOTWITHSTANDING, OUR ACQUISITION PROCESS, ON THE WHOLE, WORKS AND IS BASED ON THE EFFORTS OF DEDICATED AND CAPABLE PEOPLE. THERE IS CERTAINLY ROOM FOR IMPROVEMENT, BUT IMPROVEMENT NEEDS TO BE PURSUED IN A SYSTEMATIC FASHION.

THE DATA ITSELF IS BEST USED BY THOSE WHO UNDERSTAND THE CIRCUMSTANCES IN WHICH IT IS GENERATED, THE PRODUCTION SITUATION, AND THE ACCOUNTING DECISIONS THAT IMPACT ON ITS MEANING. TRENDS ARE IMPORTANT. ABSOLUTE VALUES CAN BE VIRTUALLY MEANINGLESS, ESPECIALLY WHEN TRYING TO COMPARE DIFFERENT CONTRACTORS. THE DETAILED DATA GENERALLY HAS LESS UTILITY THE FARTHER ONE IS REMOVED FROM THE OPERATIONAL ARENA IN WHICH THE DATA WAS GENERATED.

TWO QUICK EXAMPLES OF WHERE THE NUMBERS CAN BE MISLEADING FOLLOW:

(1) A STABLE MANUFACTURING OPERATION SHOWS ACTUAL HOURS AT 210 AND STANDARD HOURS AT 200. AN IMPROVEMENT TO THE MANUFACTURING PROCESS IS MADE. STANDARD HOURS GO FROM 200 TO 100. ACTUAL HOURS, BECAUSE THE COMPANY IS EARLIER ON THE LEARNING CURVE, ARE AT 150. IF THE RATIO OF STANDARD HOURS TO ACTUAL HOURS IS YOUR MEASURE OF EFFICIENCY, THE OLD METHOD SHOULD HAVE BEEN RETAINED. IF ONE IS INTERESTED IN THE LOWEST COST, THE NEW METHOD IS JUSTIFIED.

(2) BECAUSE OF A DESIRE TO MINIMIZE THE RATIO OF STANDARD HOURS TO ACTUAL HOURS, A COMPANY EXCESSIVELY USES ENGINEERING AND MANAGEMENT RESOURCES TO REDUCE DIRECT MANUFACTURING LABOR. REALIZATION FACTORS SHOW IMPROVEMENT, BUT OVERHEAD INCREASES IN A DISPROPORTIONATE AMOUNT. OR, STATED IN ANOTHER WAY, $2 IS SPENT IN ONE COST CATEGORY TO SAVE $1 IN (OR SUBOPTIMIZE) ANOTHER.

TO SUMMARIZE, OUR BIGGEST CONCERN WITH THE LEGISLATION IS THAT IT IMPOSES COSTLY NEW DATA RECORDING REQUIREMENTS. AGGREGATE NUMBERS MAY APPEAR SIMPLE ENOUGH--BUT THEIR GENERATION NECESSITATES A TREMENDOUS AMOUNT OF DETAIL, CORRELATION, RECORDING IN A CONSISTENT

MANNER, ANALYSIS, AND MAINTENANCE. MATCHING UP ACTUAL HOURS VERSUS STANDARD HOURS OSTENSIBLY WILL BE A MEASURE OF VALUE RECEIVED BY CONTRACT; HOWEVER, WE BELIEVE THERE ARE TOO MANY QUALIFIERS TO MAKE A COMPARISON OF THIS SORT MEANINGFUL ON A ROUTINE BASIS. THE WHOLESALE ACCUMULATION AND REPORTING OF THESE STATISTICS BY CONTRACTS, REGARDLESS OF CONTRACT CIRCUMSTANCES, IS OF QUESTIONABLE VALUE TO THE DOD WHEN COMPARED TO COSTS.

HAVING STATED OUR CONCERNS, LET ME ALSO SAY WE DO NOT DISAGREE WITH WHAT WE THINK IS THE BASIC INTENT OF THE LEGISLATION--GREATER VISIBILITY OF AND IMPROVEMENT TO MANUFACTURING EFFICIENCY. WE WOULD HAVE PREFERRED A THOROUGH EVALUATION OF THE PROPER ROLE AND USE OF TIME STANDARDS AND WORK MEASUREMENT IN ASSURING WE OBTAIN QUALITY GOODS AT REASONABLE PRICES PRIOR TO PASSAGE OF LEGISLATION. WE STILL RECOMMEND A SERIOUS EFFORT BE MADE TO: EVALUATE AND COMPARE THE USE OF TIME STANDARDS AND WORK MEASUREMENT IN THE VARIOUS SEGMENTS OF COMMERCIAL AND DEFENSE INDUSTRY, ASSESS THE POTENTIAL BENEFITS AND ASSOCIATED COSTS OF EXPANDED USE OF THESE TECHNIQUES IN DEFENSE CONTRACTING, DETERMINE HOW STATISTICS SHOULD BE RECORDED AND REPORTED, AND EXAMINE THEIR MEANING AND PROPER INTERPRETATION. WITH ADDITIONAL VISIBILITY MUST COME GREATER KNOWLEDGE AND UNDERSTANDING OF WHAT IS BEING MEASURED. THESE OR ANY FUTURE HEARINGS SHOULD ALSO HELP IN THIS REGARD.

IN THE MONTHS AHEAD, WE IN THE DOD WILL BE IMPLEMENTING THE LEGISLATION ASSUMING THAT IT BECOMES LAW. WE PLAN TO DO SO IN AN EFFECTIVE AND EXPEDITIOUS MANNER, AND WILL WORK WITH THE COMMITTEES AND THEIR STAFFS IN THIS ENDEAVOR IN A COOPERATIVE MANNER. WE WILL KEEP YOU INFORMED OF SUCCESSES OR DIFFICULTIES WE ENCOUNTER.

SOME OF THE DEBATE ON THE SUBJECT HAS OCCURRED AT THE PHILOSOPHICAL LEVEL AND RESULTS FROM DIFFERENT PERSPECTIVES, CONCERNS, DEFINITIONS, AND ASSUMPTIONS. I SUSPECT DIFFERENCES OF OPINION WILL BE LESS WHEN IT COMES TO PRACTICAL, CASE-BY-CASE, EXPLORATION OF DETAILS. I SUGGEST WE (CONGRESS, DOD, AND DEFENSE CONTRACTORS) GO FORWARD WITH A POSITIVE APPROACH TO THE MATTER TO ENSURE ALL OF OUR PRIMARY OBJECTIVES ARE ACHIEVED--A MORE COMPETITIVE AND PRODUCTIVE DEFENSE INDUSTRIAL BASE AND REDUCED DOD ACQUISITION COSTS.

THAT CONCLUDES MY STATEMENT. I WOULD BE HAPPY TO ANSWER ANY QUESTIONS THAT THE MEMBERS OF THE SUBCOMMITTEE MAY HAVE.

Senator GRASSLEY. Thank you very much. Let me give just a little bit of background, by way of explanation, and I say this partly, too, because I think I ought to explain. I am not on the Armed Services Committee; everybody knows that. I am not on the Armed Services, or Appropriations Subcommittee.

I happen to be a member of the Budget Committee and this Subcommittee of Judiciary that has responsibility over flow of information in an oversight capacity.

I am not one around here who has tried to influence, to a large degree, defense policy. I pursued information as a member of the Budget Committee and as a member of the Judiciary Committee because the information is very important to me, making decisions.

And a long time age, 3 years ago, I think, I pursued infomation with a person by the name of Franklin Spinney, whom Secretary Weinberger did not want me to talk to. We eventually had him before a committee of the Congress.

Somehow that's how I got involved originally because I just wanted a little bit of backup information to make broad budget policy decisions, not influence defense policy. I am still in the pursuit of information. I come from a position, as an individual, but also from a position that I feel that, as a member of Congress, I have to make the very same decisions that Secretary Weinberger and the President has to make; even decisions I am sure you are involved with on certain broad policy decisions within defense.

So I have been pursuing information for a long period of time and that is what we basically are doing through the amendment. That is basically the aspect in defense matters that I have been invloved in: The pursuit of basic information that I have to have as a Senator for the people of Iowa, as a member of the U.S. Senate, to make the very same decisions that people in the administrative branch of Government, including yourself, are called upon to make in the pursuit of your constitutional role of being an executive.

You take an oath to uphold the constitution, the same oath to uphold the constitution I do, and so does everybody else in the Defense Department. We have had difficulty getting that information, and you have not been involved with all of the difficulty I have had getting information.

So, you know, this is not just speaking to you. But I do not understand the difficulty in getting information. Again, you know, I have got to make—I am called upon to make very important decisions.

I have got to answer to 2.9 million people in my State, every vote I cast, if they ask me, and to that extent, you know, I guess I do not have any qualms, any apology at all for the pursuit of any information, as long as it does not hurt somebody personally. You know, there are certain personnel matters that should not be made public, and there are certain things in the pursuit of, for the protection of national security, that obviously should not be out in the open.

And to the extent to which I am a member of the Senate, individually, I can be briefed on those and should be briefed on those. But anything else, anything else that is in the public domain, that is what I have been pursuing.

So I am sure that you must have good reason to say the things you have said, and, you know, I do not have any problem with that.

I might disagree with you but I do not disagree with your right to say that and to take the position that you feel that you have a constitutional right to pursue. These hearings have involved other people. I think that as you sat through the two previous people before you—you were not here yesterday—but I think that other people, it seems that none of the experts agree with you.

I appreciate your explanation about concerns regarding my amendment. I have simply quoted from the memos from your office on work measurement, and again, I think you saw evidence today that the witnesses disagreed. These people were industrial engineers, industry officials, and even DOD officials.

So, I guess I would have to ask as my first question: Where is your information coming from?

Ms. GILLEECE. Mr. Chairman, you allowed me to introduce the two people accompanying me. Since they are the authors of the memos, I think rather than my putting words into their mouths, let me have them explain each of the memos to its fullest.

Mr. Kendig, have you got a copy of the memo?

Mr. KENDIG. Senator, my memorandum was prepared in my office.

Ms. GILLEECE. Excuse me. Mr. Chairman, this is the memo date June 7. This is the one that was requested by our Legislative Liaison Office which was simply provided to them.

Senator GRASSLEY. OK.

Mr. KENDIG. Our major concerns were in two parts.

Senator GRASSLEY. Now both of these gentlemen work under you?

Ms. GILLEECE. That is accurate, sir.

Senator GRASSLEY. Thank you.

Mr. KENDIG. Our memorandum was in basically two parts. The first paragraph of the memorandum addressed the use of standards in connection with Department of Defense contracts. What we were trying to portray was not a position that we were against the use of standards under defense contracts. What we were trying to portray was that there was confusion in the language in the amendment that we were asked to review, at least from the perspective of those people who would be trying to implement that amendment.

We did not understand how——

Ms. GILLEECE. Mr. Chairman, may I interrupt Mr. Kendig for just a second because, as you have indicated before, I think that's a important point.

One of the major conceptual problems with the legislation is that it takes the information from the manufacturing, and industrial engineering environment, and reports it through the chain of auditing and contracting, where people are not familiar with what the raw data means and where the use is questionable.

Senator GRASSLEY. Would you hold just a second.

Remember that that says "cause to be recorded." It does not say anything about reporting.

Ms. GILLEECE. We understand that, Mr. Chairman, but we question whether you did not also want us to be available to report to you when you needed the information.

Senator **Grassley**. It does not say anything about reporting or collecting.

Mr. **Kendig**. It does not, sir. I agree with you.

Senator **Grassley**. OK. Proceed.

Mr. **Kendig**. We still have the problem. What was furnished to us for comment was a copy of the Congressional Record of May 24. In that Congressional Record of May 24 the—presented the bill plus the comments that went along with the bill, and in those comments that went along with the bill were words that stated that the information that would be so recorded, would then be available for presentation or submission; the Congress then would be able to review it and be able to make their judgments.

These are things that caused our concerns. Now, as I was saying, that in connection with the first paragraph which deals with the standards, we were looking at it from the viewpoint of those accountants who would have to implement this thing, and although we had no problems whatsoever with the standards or the use of standards——

Senator **Grassley**. Let me interrupt, and it is not to disagree with you. I just want to say that later on, I will explain why we wanted the information, but go ahead.

Mr. **Kendig**. Yes, sir. We do not disagree with the use of standards at all; it was just the concept of how these things might be used by the nonindustrial engineers. In fact I had much success with the use of standards when I was an auditor at the Westinghouse plant in Baltimore. Our second major concern, however, was the need to cause to be recorded all of the negotiated cost, proposed cost, and actual cost in connection with all contracts of $100,000 or more.

This is the way that we perceived this. In fact when we were reading this, we were looking at the section and it was not designated as that, so we were looking at it and we were seeing that this apparently was going to be needed in connection with all contracts that were not awarded on a sealed bid basis.

Now that is what the section that is referred to requires and on that basis, as we saw it, since there was no starting date—none whatsoever—we said does this then apply to all open contracts, and if it does, do we have to go back over 5 years worth of possible open contracts and accomulate all this data? Must we have it on hand so that it can be reported?

The problems, of course, are that we in the Department of Defense, if we are talking about just the negotiated ones, which apparently it has been narrowed down to at this point in time—if it is the negotiated ones—we do in fact have the proposed cost from the contractors that is sitting out there. In connection with what was negotiated, we have our contracting officers' understanding of what the negotiated amounts are, and then as for the recorded costs, the contractor does record this cost in his records; all these things in a consistent manner

However, we have an original proposal received from a contractor, and typically, on any large contract, there are literally hundreds and thousands of subsequent negotiations that take place because of changes under the contract.

We do not, as a matter of course, take these changes that are negotiated, and line by line, item by item, add these up, so that when we have eight, an original negotiation and subsequently maybe a hundred or more negotiations under the same contract, we total up the total but what we do not total up is all the little elements of cost.

So that if anybody wants us to say what were the total costs negotiated under the contract by line item, we would have to cause a system to be instituted now to start capturing that data for future contracts, and if it was applicable to the contracts that were already open, we would have to go out and perform a massive data collection and data merging to come up with this information.

And this is what we believed we were faced with when we were writing this memorandum. The bottomline in my memorandum, which I think is the most important thing, was not that we are opposed to this kind of thing, just that we just did not think that it shoud be adopted unless we had some kind of hearing to determine, you know, whether this would be beneficial; that is, going out and spending all this money to merge all this data.

In other words, a clarification so that we would know what we had to do, when we had to do it, and the best way to do it in the most efficient manner, and that is the basis for my memorandum, sir.

Ms. GILLEECE. Dr. Stimson was the author of the subsequent memo which was taken with him to the meeting of the congressional staff.

Senator GRASSLEY. OK.

Dr. STIMSON. Thank you for the opportunity to be able to explain this paper since it was the subject of much conversation yesterday.

I would like to build the proper context, first. There has been much discussion on the pros and cons of work measurement and specifically 1567.

It is my office that released Mil Standard 1567 and so we were in full support and accord with the provisions of 1567. So the issue here is not the merits of 1567.

The point paper itself resulted from a telephone call from a staff member on the House side who asked for my opinion of the potential impact of the proposed amendment. I was asked to come to a meeting to discuss the potential impact. This paper was a point paper for use as a discussion paper at that particular meeting. A representative of your staff was present at the meeting.

The meeting lasted a little over an hour, and we never really got around to much discussion on these points because most of the time was spent on the basics of work measurement.

So in fact there was not much discussion on the point paper. I want it clearly identified that this paper was not prepared as a DOD-wide position on the amendment, but rather, what my opinion was, at the request of a House staff member who was holding an informal meeting on this proposed amendment.

Senator GRASSLEY. Well, let me clarify, then, with Ms. Gilleece. From that standpoint, then, since he works under you though, is not this your position?

Ms. GILLEECE. Mr. Chairman, it is specifically a paper presented for his use in discussion, explaining some of the concerns we had on the amendment. It is not per se a DOD position, but it certainly does incorporate many of the concerns that we have in the definition of what the legislation was intended to mean.

I think it might be useful, Mr. Chairman, if Dr. Stimson would go through, at least generically, some of the points.

Senator **Grassley**. Oh, I want him to have whatever time he wants. I just wanted to clarify that.

Dr. **Stimson**. What I will do is take one example, but I will be glad to go through each one of the items.

I will take the example of quality, because that seemed to come up with everybody yesterday. The discussion concerned the adverse impact on quality that could result from work measurement.

Actually, that should be worded "improper use of work measurement." The concern is that with the legislation we have created a different environment for the use of work measurement. It is one thing for work measurement to be used inside a manufacturer's plant by the people, both government and industry, that are involved in that particular operation.

The legislation of work measurement is another thing, particularly when the data could be presented publicly, and could be used for many other purposes.

This puts a great deal of attention on work measurement. What can happen is, that with the overattention and overemphasis on meeting the work measurement standards, the behavior of the people in the factory well be directed to meet the work measurement standards, and to get the products out the door.

My work on a national level on quality, in which I have worked both with the private sector and as well as defense contractors, revealed that one of the problems with quality in the United States is overemphasis on getting products out the door, at the expense of quality.

An overemphasis on meeting work measurement standards, which is, I will add, an improper use of work measurement standards, can lead to pressures on the worker to get the products out the door, regardless of whether they are of good quality, or not.

Denning, who is credited with being the grandfather, or the father of the renaissance of quality in Japan, makes this as one of his major points in his 14 points management principles.

Principle No. 11 says that work measurement directed toward meeting quotas can damage quality, because usually when you establish quotas—and he uses the word quotas—when you establish quotas in the factory, quality usually takes a back seat. And so this is the great concern with the issue of quality. I can further elaborate on that, if there are any questions. That is one example. I do not know if you want me to go through any other of these at this point, or not.

Senator **Grassley**. You may want to go through something else, but before you do, I want to bring Senator Specter into this, if he wants to.

First of all, I am sorry, yesterday you were here, you did speak yesterday, I did not recognize your contribution to the work of this subcommittee at that time. I want to do that now.

I would also like to say that we have now before us people from the Department of Defense. We have had testimony on work measurements, being a very important aspect of measuring productivity, applicable to the defense industry as well as to the commercial sector.

You sat in on some of that yesterday. Today, that was affirmed, as it was yesterday. We asked the Department of Defense to comment on memos that they issued in opposition to an amendment that I sponsored on the DOD authorization, and we are at this point in the discussion.

OPENING STATEMENT OF HON. ARLEN SPECTER, A U.S. SENATOR FROM THE STATE OF PENNSYLVANIA

Senator **SPECTER**. Thank you. I want to commend you for your initiative. I want to be here as much as I can. Very frequently when only the chairman presides at these hearings, there is a sense that the other members of the subcommittee are not concerned about the matter, and that is not so. Because I have other conflicting appointments and I cannot stay long this morning, but I did want to stop by and indicate by support for the activities of you, Mr. Chairman, and let the people know who are testifying that I am very much concerned about this, and that the staff and I will be reviewing the transcripts, to try to do what we can on these very important subjects.

But I think it is important that people should know, that simply because Senators are not here for very much of the proceeding, or perhaps not at all, that it is not an indication of a lack of concern, and we will followup on it, so I thank you for the acknowledgement, Mr. Chairman.

Senate **GRASSLEY**. Thank you, Senator Specter.

Do you want to comment on other specific things? I should give you some more time, if you want it.

Dr. **STIMSON**. I will wait until you have some questions, rather than take the time now, unless you would prefer that I go through each one.

Senator **GRASSLEY**. Could I say that not even the Senate Budget Committee could get this data, despite the fact that it is used and it happens to be subject to the Truth in Negotiation Act, and therefore, the Government has a right to it. You may have heard Pat Haugh say that we are crazy not to get this information. Now I would have to ask, are we crazy, or is there some other reason why we do not get this data?

Ms. **GILLEECE**. Mr. Chairman, I have to agree with your consistent statements, that data that is available to us absolutely should be available to you, and I continue to support that position.

The problem is, however, that there is some data that is not currently available to us, and we must then go back and retrieve that from the system.

That has been the difficulty, as you know, in responding to the request from the Budget Committee. We have discussed that with members of your staff, members of the Budget Committee staff, at numerous and sundry meetings.

I can only tell you that I think that you should absolutely have the tools necessary for you to be able to assist us in improving the productivity and quality of our defense contractors.

Senator **Grassley**. The information is available, contractors have it, and our witnesses have said that. It is kind of case of "how tough do you want to be in getting that information"?

Mr. **Kendig**. Sir, availability of data, that is, the existence of it, and the ability to take that data and furnish it to somebody are really two different things.

Yes, the data does exist. If we are talking about the cost data, the proposed cost, the negotiated cost, and the recorded cost, it does exist. If you were to ask me to just get you the recorded cost against any contract, at any given point in time, I could get that data for you probably within 24 to 48 hours.

When I am also asked at the same time to get the comparable data for comparison purposes, that is, the proposed cost under that contract, and the negotiated cost under that contract, because of the way the records exist right now, these are not easily gathered figures.

We do not have a system at this time which requires our contracting officers or the contractors to take each one of their proposals, to make a determination after the negotiation, what was the complete—what was the, their understanding of the line by line negotiation, and to take all those things and constantly update them for each subsequent negotiation of each change.

Individually, those packages exist out there, but in order for me to furnish to any one who requests that data, at this time, I have got to cause that data to be accumulated and merged, and this takes time. And it takes a lot of money to do this, if we are going to start now with contracts that are already in existence for 4 to 5 years.

Senator **Grassley**. Well, in regard to our original request, we were not asking for a system, we were asking for a one-time set of information, and you said you had been trying to get it for us. We have gotten about 10 percent of our information and, as you know, that was 6 months ago.

I would like to recount for the record, if I could, along this line, a brief history of Congress' dealing with your office on the subject of work measurement time standards.

It was in January of this year that your office was instructed to coordinate in a letter sent to the Secretary of Defense by the Chairman of the Budget Committee, Mr. Domenici, and the ranking Democrat on that committee, Mr. Chiles.

The letter requested data relating to the bills of labor, material and overhead, for all of the SAR systems. That information was due on February 1.

Now it is 6 months later and we have received only 10 percent of what was requested, and that information actually came as a result of subsequent communication on our part with the services.

Meanwhile, your office, from this standpoint, has refused to cooperate and coordinate this congressional request. We were first told by your office that work measurement is not used in the defense industry. Then we were told it is used only in MIL standard 1567, where that is on contract. Then when the services finally provided standard hour data on three systems each, you office told us no more work measurement data existed.

Now I subsequently wrote letters to the Air Force and the Army, and we got more work measurement data, despite your office's denial of its existence.

That is the current 10 percent, quantifying it, that 10 percent of the information that we had originally requested on the part of Senator Domenici and Senator Chiles.

I think you know I am just a freshman Senator around here, but I did not think that Senator Domenici, as chairman of the Budget Committee, would be denied that information.

I sometimes expect to get pushed around, but I do not expect him to be pushed around. I do not think he expected to be pushed around. I think he is surprised that he was pushed around.

I think that he was exasperated, and so many times he says, "I don't know what else I can do."

Now yesterday we heard testimony contrary to what your office has told us, that work measurement is used widely in the defense industry.

We know it is not available only where MIL standard 1567 is on-contract, because the MIL standard requires no data collection. Two Army witnesses told us yesterday, the Army, which does not use MIL standard 1567, does use labor standards, and the Army gave us standard hour data 2 days ago for five more systems. And one of our witnesses yesterday told us that work measurement is even being used by shipbuilders and submarine builders for the Navy, which also has implemented MIL standard 1567.

Now I can only conclude that your office is either badly misinformed, or it has intentionally dragged its heels, and I would like to have you clarify which one it might be.

Ms. GILLEECE. Mr. Chairman, it is neither. My office, as you know, does not in fact hold unto itself any of the information.

The information must come from the services. The data, as I believe you are now aware, left my office on the 11th of July to go up to the Secretary for signature.

Senator GRASSLEY. Could I ask you, we got it from the services; why could not you have gotten it from the services?

Ms. GILLEECE. Mr. Chairman, we did get it from the services and that is what went up to the Secretary's office on the 11th of July.

The information request goes from us to the services and we are specifically asking them for the information that has been requested. In point of fact, some time ago, it is my understanding you asked if you could go directly with the services and we said by all means. We are, in this particular instance, a conduit. You ask us for the information; we must go back to them for the information. We do not have it; they do.

Senator GRASSLEY. Now are you referring to the letter that Domenici sent?

Ms. GILLEECE. I am referring to the information that you said has not become available to you at this time directly from the Secretary of Defense, albeit you have gotten it from other places.

Senator GRASSLEY. OK. And it is from the letter that Senator Domenici requested the information, is that correct?

Ms. GILLEECE. Yes, sir.

Senator GRASSLEY. And Senator—OK. I just wanted to clarify it.

Ms. **Gilleece**. Yes, on the 11th of July the information left my office and went to the Secretary's office on the 16th of July. As I indicated to you before, the Secretary is very much involved in this issue and is himself personally reviewing the information.

Senator **Grassley**. Well, you did not respond to Senator Domenici and it was only when I asked for the information individually, that there was any information received at all.

Ms. **Gilleece**. Let me do this, if I might. Mrs. Eleanor Spector is here. She is the assistant deputy in my office who has been specifically charged with responding to this particular request. I think it might be useful if she went through in some detail what involvement my office has had in providing the information to the Budget Committee.

Mrs. **Spector**. Sir, there was absolutely no intent to deny you the data that you wished, and I was trying very hard to obtain it. It is not easily obtainable.

The way that it happened was, your initial letter came in from Senators Domenici and Chiles, and we put together a package saying what exactly it was you had asked for, and that it was an extensive amount of data.

It was data on approximately 94 SAR programs, which you had asked for. Each of those programs has about six contracts; many of those programs go back as far as 15 years.

For those multiples of contracts, as we perceived your request, you were asking for proposed, negotiated, and actual cost, by cost element, for all of those years, including rates, engineering and manufacturing hours and material—a rather massive amount of data.

Now we then met with Mr. Kolesnik and others on what you were asking for. We said that it was an enormus amount of data but that it could be furnished.

Ms. **Gilleece**. Let me interrupt for just a second. All the way through this process, the services were involved.

Mrs. **Spector**. That is true. Subsequent to that meeting, there was a meeting attended by Mr. Kolesnik and others of the Budget Committee staff with the services. That was within a week or two; it was at your staff's convenience, in our offices, and the data request was presented to the services.

And at that point, we started feeding data to you in response to the letter, albeit informally. There was no letter that came back in response to the letter, but we were feeding, I would estimate, about 150 to 200 pages of data to the committee from the services, and it was exactly what the services were giving me.

In fact, I furnished it with their cover memos right on it. There was no attempt to deny you any data nor anything they gave me.

Subsequent to that time, there was another meeting with your staff and we said, "Well, have we satisfied you? We have given you what the services have given us."

At that meeting, there was an agreement that we would give you data on five SAR programs per service. The data required was pretty much what I described initially, only on 5 programs instead of 94 programs. The data on those five programs then came in at varying times from the services. The services then told me you had asked them for the data directly, and asked if it would be all right if it were furnished to you directly. I said, by all means to give it to you, do not deny it.

Our instructions, by the way, from Secretary Taft were to give you everything you were asking for, and we were trying valiantly to do just that. The services then may have given you data that is officially now on its way to Secretary Weinberger.

So, the data you are saying you got from the services that we did not provide, is only a matter of timing, sir. It is not that we are trying to deny it; it is that now we are giving an official response back with the data. That response will come from the Secretary, but you have been given the data informally by the services, as we had said was all right to do.

So, the same data is on its way to you officially.

Ms. **Gilleece**. I might add to that, that while you were not a signatory to that original letter, I have also asked our legislative liaison office to contact the staffs of the two Senators to make sure that anything that comes out of our office goes also directly to you, in addition to them.

Senator **Grassley**. Well, the bottom line is, your office coordinated the request and we still only have 10 percent of the request in hand—and that is 6 months late. And what we did get, we had to circumvent your office. Now, you know, I am told a lot of various bureaucracies, it always seems like, what will we get tomorrow? Mañana? The information that we requested, I was hoping to have it as part of this budget process this year, not the budget process for next year.

And that is why the request was made very early. We actually could have used it yet as late as March, but we did not get anything by then.

I think there are simply too many contradictions to what you are saying, by witnesses that we have had, by other experts, and by documents my staff has collected.

There are contradictions on other points as well. I had an amendment recently pass the Senate and the House that would require access to standard hour data.

Your office put out two memos and point papers in opposition to the amendment, and yesterday, virtually every witness, including Dr. Richard Engwall who was the AIA representative, found difficulty defending your position.

I asked them to comment on eight points that I picked at random. Two of the witnesses made a comment that no industrial engineer could ever have written that point. I believe they were referring to the statement your office made about how work measurement would adversely impact quality.

I also had two memos here from the joint services saying time standards should be more widely used, and contradicts other points in your memo.

So my question is, since you seem to have an isolated viewpoint on this, where is your information coming from—is it coming from industry? If it is, I could see where industry would like to have you take the position that you have taken. I would like to have a response.

Ms. **Gilleece**. Mr. Chairman, I believe that the witnesses today have specifically defined for you the basis upon which they have come to the conclusions that they have. It is extremely important, it seems to me, at this particular time, that we focus attention on making sure that we, in the Department, obtain from Congress some specific definition on the interpretation on that provision on the authorization bill.

I also have the responsibility in my office for the Defense Acquisition Regulatory Council, which will be required to implement that law.

I will hope that Congress gives them some specific direction in the statement of manager's language so that we do not leave it open to interpretation, but rather merely implementation.

Senator GRASSLEY. Well, as I have indicated, it is not difficult to go out and find engineers in your own services who disagree strongly with your position. Have you ever talked to any of them?

Ms. GILLEECE. I have talked to the people in my office about the issue of the legislation, Mr. Chairman.

Senator GRASSLEY. Well, do you confer more with the industry on this issue than you do with DOD own's engineers?

Ms. GILLEECE. To my knowledge, I have never spoken with industry about this particular legislation.

Senator GRASSLEY. I would like to find out to what extent you have tried to listen to industrial engineers from the services, since this is their area of expertise.

I know of one, for starters, who has been attempting to contact you without success. Have you—you do not seek these people out?

Ms. GILLEECE. Mr. Chairman, we are very supportive of work measurement. There is no disagreement, it seems to me, between the position my office has taken and that position of the services in support of work measurement.

The difficulty we have, which is evidenced by the memos, is because the legislation leaves too much up to question. I have no problem supporting the position of the services on work measurement.

In fact, as I indicated before, Military Standard 1567 is a coordinated document with the services which came out of my office.

Senator GRASSLEY. Where are you getting your information?

Ms. GILLEECE. Regarding the legislation, Mr. Chairman, I am getting it from the experts in my office.

Senator GRASSLEY. The substance of work measurement generally?

Ms. GILLEECE. The substance of work measurement generally is the responsibility of Dr. Richard Stimson, and he has spent time, through my tour in the Pentagon, explaining to me the ongoing discussions that he has had regarding the standard 1567 and the application guide that is to come out.

Senator GRASSLEY. But you have not talked to industrial engineer people in the services?

Ms. GILLEECE. Dr. Stimson is the responsible party to do that and I am sure that he has.

Dr. STIMSON. I might add that I have an industrial engineer who works directly for me, who also has a graduate degree, and we do discuss——

Senator GRASSLEY. Does that person have factory experience?

Dr. **Stimson**. Yes, he does. As I do personally myself, even though I am a mechanical engineer. I would point out that Fred Taylor, the founder of this whole movement, was a mechanical engineer, and his particular philosophy, scientific management, was advocated by the American Society of Mechanical Engineers.

So there is a very close relationship between mechanical engineering and industrial engineering. We are in continual contact with the industrial engineers in the Army, Navy, and Air Force, so we are not operating in a vacuum on this issue. You mentioned the other witnesses talked abut quality.

I might add that these witnesses were all industrial engineers. You have not heard from the quality community. If you had talked to the quality community, which is another community I represent, you would have found that there is a great concern about the overemphasis on meeting quotas at the detriment of quality. As I pointed out, the patriarch of the quality effort is Deming. He lives in Washington, DC, and is now about 85 years old. He still actively consults. Most of his consulting is with the private sector. If you need any further elaboration of what the adverse impact if quotas on quality is, I am sure that it would be easy to get his comments.

I might add that he predicted 30 years ago, in a speech in Japan, that Japan was going to outproduce and build better quality products than we do in the United States.

The issue of quality that we have is a pervasive one, not just in the Defense Department but in the private sector as well.

Dr. Deming has laid out the scenario for Japan to follow, they have followed it very explicitly, and I think the results are self-explanatory.

Senator **Grassley**. If you are not operating in a vacuum and having continuing contact, why did it take 6 months, then, for us to get the data—how far this data is received, reached already?

Mr. **Kendig**. Again, sir, I can only repeat, the real problem is not that the data is not out there some place. It is the gathering of the data, accumulating it from all the points from where it is lying, and simply transmitting it, or collating, or whatever it is that is necessary, to get it up to the people that want it.

There is no question about the fact that the data is out there some place. We do not say that the data is not there. We simply have said over and over again, it is not there in the form that you are asking for it, and it takes time to gather it, put it together, and transmit it to you.

Ms. **Gilleece**. Mr. Chairman.

Mr. **Kendig**. That is our only problem, and the cost of doing so.

Ms. **Gilleece**. We also have here representatives from the services. You may wish to ask them specifically why it took them the time to formulate the data. I am sure they could give your a better definition of it.

We also have, by the way, the letter from Senators Chiles and Domenici, dated April 30, which is an ongoing letter to the original letter of January 4. They state not only that they would like to thank us for our cooperation in providing the data, but in order for the committee to complete the analysis it has begun, request that DOD provide the remaining data which was requested in our original letter. It goes on to describe the additional data.

So it is not as though we have not focused our specific attention on requesting that.

Senator **Grassley**. Let me suggest that I signed off on that letter because we were expecting cooperation.

At any time while you were taking these stands on work measurements that would be favored by the industry but apparently not by those overseeing and implementing work measurement in the field, did not solicit employment from defense contractors?

Mr. **Kendig**. There is nothing in my statements—oh, I'm sorry.

Senator **Grassley**. Im asking Ms. Gilleece.

Ms. **Gilleece**. It was directed to me. Mr. Chairman, would you repeat the question, please.

Senator **Grassley**. Did you solicit employment from defense contractors at any time? I have a Washington Post article here that says—and I would like to read just two paragraphs.

> June the 27, 1985. A top procurement official has written to defense contractors exploring prospects for getting a job as a consultant to the defense industry after she leaves the Government Defense Department and industry sources said yesterday Mary Ann Gilleece, Deputy Under Secretary of Defense for Acquisition Management acknowledged that she has written to some defense contractors for the purpose of assessing the possibility of beginning a new corporation.

So I ask you: At any time while you were taking these stands on work measurement that would be favored by industry, but apparently not by those overseeing and implementing work measurement in the field—and that is what the testimony before your testimony relates to—people out there, in this business, favoring these things—did you solicit employment from defense contractors?

Ms. **Gilleece**. Mr. Chairman, let me answer that in two ways.

Senator **Grassley**. Or did anyone on behalf of you solicit such information? Go ahead.

Ms. **Gilleece**. First of all, as you indicated, the position that we had taken, you said, was not supported by either people in industry or in Government.

The position that we have taken is specifically on the legislation and the need for better criteria to make sure that we have a direction toward implementation. As far as I am concerned, there is no disagreement between my office and the services on the benefits of work measurement. Now as far as the reference that you make to letters which I sent, in fact I did send letters, not only to defense contractors but to some other people, asking them if they felt this was a viable idea.

Senator **Grassley**. Well, was that going on while you were taking these positions? The——

Ms. **Gilleece**. Which positions, Mr. Chairman?

Senator **Grassley**. The positions on work measurement and the position on the amendment.

Ms. **Gilleece**. I have always maintained my position on work measurement, which is that I support work measurement.

Senator **Grassley**. Well, as I have said so many times at this hearing, all the experts seem to disagree with you.

I think that I will stop the questioning, and thank you very much for participating, and call the next panel.

Ms. **Gilleece**. Thank you, Mr. Chairman.

Senator **Grassley**. Our last witness is A. Ernest Fitzgerald, management systems deputy, Office of the Assistant Secretary of the Air Force, Financial Management.

You have been a person to frequently testify before various committees of Congress over the past 20 years, so I do not think you need any further introduction, and I would ask you to proceed with your testimony, and then I will have questions of you.

STATEMENT OF A. ERNEST FITZGERALD, MANAGEMENT SYSTEMS DEPUTY, U.S. AIR FORCE

Mr. **Fitzgerald**. Thank you, Mr. Chairman. As the other witnesses have done, I will give you a brief rundown of my professional experience, actually, back before my professional days.

I was brought up in and around factories. My father ran a pattern shop, making patterns for foundries, and during the time I was in high school, and shortly thereafter, I served as an apprentice working in and around pattern shop foundries and machine shops.

After service in the Navy, I went to college and got a degree in industrial engineering, took extensive graduate work, all that was available for several years in industrial statistics and quality control.

My first professional experience was in fact in quality control, as a quality control engineer for two companies, one a commercial manufacturing company, another an aircraft company.

I have received all along basic engineering, industrial engineering training and experience, including heavy use of work measurement, in both the valve and fitting business where I first worked in aircraft, and the chemical and aluminum business, and then as a—successively, a consultant, management consultant, and principal, in the management consulting firm of Arthur Young & Co. During this period we, my associates and I, installed work measurement systems covering tens of thousands of people.

Just as Mr. Haugh said, we were not work measurement cultists; we used all approaches to work measurement: predetermined data of at least three different systems; methods time measurement represented by Mr. Castle here yesterday; work factor, and basic time motion study, a Canadian system which was developed by our sister company in Canada.

We made extensive use of time study both in factories and in indirect and support areas. Our work was directed at reduction of cost and improvement of quality through the use of these techniques.

We had to save money or we were thrown out. We did not stay in our jobs as consultants. Then, I became president of a small consulting firm, Performance Technology Council, later Performance Technology Corp., where we did similar and more extensive work.

Following that I joined the Air Force and I think my career from then on is known. In addition to reading my very brief statement, Mr. Chairman, I have new instructions from the Secretary of the Air Force which I have just received after arriving at this hearing, and with your indulgence, after reading the very brief statement, I would like to go into it.

The use of work measurement to produce labor time standards is a generally accepted approach to evaluate objectively proposed or actual labor performance.

Air Force cost management policy includes encouraging, sometimes requiring, contractors use of work measurement systems for "touch" labor, that is, hands-on manufacturing and test labor.

To clarify, the official Department of Defense definition of the way a time standard is built up is to use generally accepted industrial engineering processes to develop normal time—not ultimate time—for specified tasks, then to add allowances to these normal times to allow time for the workers to take care of personal needs, to rest, and to accommodate unavoidable delays.

Please note that the definition is based on a prescribed method. In practical terms, this means that the touch labor, normal and standard times, will be based on methods in use at any given point in the evolution of a manufacturing project.

This means that our contractors should maintain their time standards bases to reflect changing conditions as the designing, manufacturing, and testing portions of a program proceed through their phases.

Senator GRASSLEY. I am going to tell you, when you get down there, you are talking to a farmer, and I want that put in lay language for everybody here in the room to know what you are talking about.

Mr. FITZGERALD. OK. Well, that simply means, as the methods of doing the work change, then the standards should reflect that changed method, so that at all times, they represent, should take times using the fair day's work approach—that is, the time that a qualified worker should take to do the job, whatever the method, building in the complexity, or lack thereof, of the manufacturing processes.

The application of this system would have all the benefits that I have listed here, and to save time, I will not read them all, but it goes beyond simply squeezing the worker.

That is another disinformation campaign that we are simply focusing on workers. We are not, we never were.

Senator GRASSLEY. Elaborate on that disinformation campaign.

Mr. FITZGERALD. Well, you know, we keep hearing that we are focusing only on the worker level, and this is inappropriate, when it is rolled up to the top level. As Mr. Haugh said, I view this personally as a—in a way to measure the effectiveness of management, and all of its activities in the manufacturing area. To some extent it will even give you an indication of—when used in special ways, for limited purposes, of how well they are managing overall.

But just to elaborate on it, we focused very strongly on the capturing of this data, work measurement data, and bills of material, as early as possible in the evolution of a design.

We have tried to push the process back up into the engineering design departments, rather than wait until the thousandth unit, or some such.

We find that we can elaborate on this, my associates and I, or I by myself, in specific cases that we are doing right now as we get through this.

The Air Force Secretariat is putting special emphasis on capturing bills of labor priced in standard hours, along with bills of materials priced in dollars, to identify these emerging unit cost of manufacturing. That is, what you can detect at the time the product is being designed and as it goes into the early stage of factory work.

With the rapidly improving predetermined time standard systems now available, we are finding that we can get a useful handle on what complex items should cost in labor and material, much earlier than has been the usual practice. This approach is already sharpening our early warning systems. As our people learn more about the approach, we believe that our taxpayers and our operators will realize significant benefits.

On April 10, the Secretary of the Air Force, at the request of Mr. Carver, the Assistant Secretary, approved a project designed to improve the Air Force's ability to deal with cost management.

It is my responsibility to lead this effort, which will involve among other things not only improvement in the use of automatic data processing, but the institutionalization of cost tracking to include work measurement and the bills of material such as you have requested.

Now I mentioned before that I had new instructions from the Secretary this morning, and to give you a background, just a bit of background on why this is important, and also to clarify some of the previous testimony, I want to go into some of my historical records.

Dr. Stimson said that his office issued the MIL standard 1567. He is technically, I suppose, correct, but to give you the reason for the Secretary's decision this morning, I want to go back to when we first got——

Senator GRASSLEY. Are these the same as my staff got from your files?

Mr. FITZGERALD. Yes, sir. I have some additional papers which I will be glad to make available to them. Yes, I have, I have the——

Senator GRASSLEY. Are you presenting them for inclusion in the record?

Mr. FITZGERALD. If you wish, sir; yes, sir. I will be delighted to have them turned over to the staff.

The fact is that the Military Standard that was issued on work measurement for—on the 11th of March 1983, was not coordinated fully with the services.

The fully coordinated standard was dated on the 20th of October 1982, and in fact Dr. Stimson blocked publication of it.

We had known of some time for the plans for the——

Senator GRASSLEY. Who is Dr. Stimson?

Mr. FITZGERALD. Dr. Stimson is the associate of Miss Gilleece who just testified prior to my appearing here.

We learned by a copy of a memorandum that was sent directly to the military staff of the Air Force on the 22d of October, that Dr. Stimson was blocking publication of that. It is a very, very brief memorandum, so I will read it to you.

> At a recent meeting with AFFC personnel, a draft addition to the forward of Military Standard 1567 was suggested providing limited application guidance and a commitment to develop additional guidance in the future. Such an addition would be in conformance with DOD policy and appears appropriate—and here is the only reason

> given—appears appropriate in light of industry concerns regarding this document. It is requested that Mil standard 1567 not be published until this issue is resolved with this office.

My boss and I met with Dr. Stimson and his then boss, Dr. Bill, Mr. Bill Long, who was Miss Gilleece's predecessor, I believe, at which time they could only say that industry didn't like it.

Well, we already knew that. You know, we had been talking to industry at that time for 17 years. We knew very well that industry did not like it, knew all the reasons why, but we had to pin them down very specifically, Mr. Chairman, on the reasons.

And I finally got Dr. Stimson, who did not display any real working knowledge of the subject at all, to give me the name of the spokesman for the CODSIA, the Council On Defense and Space Industry Associations, which he gave as Mr. Gordon Erkhardt of the Boeing Co., and I have, I collected and have with me my contemporaneous memoranda of my telephone conversations with Mr. Erkhardt on the 1st of December 1982. Mr. Erkhardt was very forthright in his statements.

Senator GRASSLEY. Can I interrupt you?

Mr. FITZGERALD. Yes, sir.

Senator GRASSLEY. Because I would like to tell you—although I know you were here yesterday, but we received an internal memo of a major contractor that states a preference for watering down those measurement requirements, and apparently, according to the documents, there is at least an attempt on the part of DOD now to vote a tailoring of the MIL standard.

From this morning's testimony there appears to be further grounds for suspecting industry pressure is being brought to bear.

Would you review for the record the chronology and circumstances associated with the documents I have collected from you and indicate the roles being played by the Air Force, OSD and industry.

Mr. FITZGERALD. I will do my best, sir, and I will be willing to answer any questions that, where I seem to omit something in the process.

But in any event I spoke with Mr. Erkhardt twice on the 1st of December 1982, and the first time he was very forthright, just in accordance with the plan of action which had long been evident, but we did not have documentation on until Mr. Chauhan presented it yesterday. That is, oppose at all cost, then if all is lost, tailor, and then on the second page of Mr. Chauhan's memo, to oppose using work measurement standards as a basis for pricing, instead, in favor of using actuals.

It is very easy to see why industrial contractors would like to use actuals. You may have noticed the AIA witness smiling broadly and chuckling to himself yesterday.

You would laugh too if you have been able to get away with what they did on the pulley puller, and they have done that consistently by loading up the cost and then selling cost to the Government.

See, we do not really—our examiners of these proposals are not really thinking product. We buy their cost, Mr. Chairman, and they like that. This is a very comfortable way to do business and we understand that. We are just not sympathetic. In any event——

Senator **Grassley**. You ought to elaborate on this pulley puller you were talking about.

Mr. **Fitzgerald**. Yes, sir. Well, this was one of the items which I believe was discovered by Mr. Chuck Whirley of Senator Roth's staff, a year ago last Christmas, and it was brought to his attention by an auditor at General Dynamics who had not been able to get anything done about it at that level.

Subsequently, some of the items in the order were—we were told were canceled. The Allen wrench was one that was said to have been canceled, but this I believe we paid for. I think, if I recall the numbers correctly, we were offered the item, which is a small item, as you described yesterday, worth perhaps $5 to $10 if you bought one off the shelf in an auto shop; no more than $30 or $40 if you had it made from scratch by an aerospace machine shop.

We were offered this for $10,130 by General Dynamics who had subcontracted with Westinghouse to make it. After strenuous negotiations, it is said, we beat them down to $8,800 and declared a victory, but we are still reviewing this and similar things.

So you can see why, the basis being—let me backup—that that was a good price, because the contractors actually spent that much money. If they can manage, they can manage to load the job to that extent, then our auditors will sometimes say, as they did in the case of the Navy hammers and things of that—the tools in that order, that the prices were exorbitant but legal, made legal by the fact that they spent the money.

In any event Mr. Erkhardt said, "We want to continue to use actuals in the past, everybody trained to relate to actuals." That is true, but it is wrong. He then called me back again to give me additional information, said, "We are primarily oriented to actual cost." Mr. Chauhan communicated with me, saying that on the 12th of December, a week later, that Mr. Hugh Bradey, a vice president of manufacturing at TRW, stated, quote: "Industry is oriented toward using actuals." Mr. Hugh Bradey.

Well, the upshot of Dr. Stimson's intervention was to solicit tailoring, just as industry wanted in the document, which inhibits our ability to get meaningful comparable figures from one to another.

I am constantly amused and chagrined to hear people from the procurement community saying that the figures are noncomparable, when they themselves, through tailoring, have taken giant steps to make them less comparable than they should be.

We do not need 1567 to get work measurement in most places. What we need it for is to get consistent and more reliable information.

That is the only purpose. In any event the Office of the Secretary of Defense, Dr. Stimson personally, I am told, negotiated an objectionable forward soliciting tailoring, that was issued without coordination after discussions with two Air Force generals.

I was not involved even though I am supposedly involved at—I am responsible at the highest Air Force levels for such matters. We have had continuing controversy and trouble because of this bilateral additional to the military standard. Pat Haugh was very unhappy about it, and we—you know, I personally feel a responsibility to him, and those who went before us in bringing the process this far.

That brings me to where we are this morning. After I arrived in the room——

Senator **Grassley**. Another alternative to tailoring, or the words "watering down," would that be applicable?

Mr. **Fitzgerald**. Well, I agree with Mr. Haugh, that there are cases where tailoring might be appropriate. I would like to see our very moderate requirement set forth in the military standard stated as amendments.

For example, we have stated that we want type I engineered standards. That is, regular uptown time standards, on 80 percent of the work, of the touch labor effort.

Let's take, for example, Pratt & Whitney, who make aircraft engines for us. That is a ridiculous requirement for Pratt & Whitney, who are mostly a machine shop, well-defined work. Some of their projects and products that we buy from them have been in manufacture in one form or another for more than 20 years.

The TF-30 engine, for example, was one of the many projects that got me in trouble back in the 1960's. They are still making them. It is a different—it has been upgraded from time to time but it is still the same thing, essentially the same approach to manufacturing the thing with incorporating advances that have been made in the meantime.

We should have no less than maybe 95 percent, or 98 percent coverage of type I standards. I would say that we should not allow the watering down without scrutiny by the top levels.

Most, unfortunately, of the tailoring has been watering down. So, we could manage tailoring if we did not have the intervention of OSD, allying themselves with procurement communities in the services.

Senator **Grassley**. Are you saying there should not be tailoring? The industry wants tailoring and people in DOD are pushing tailoring?

Mr. **Fitzgerald**. Yes, sir; almost indiscriminately. I was going—I jumped ahead on some of my points. In discussions that we had with Dr. Stimson, my bosses and I, we asked where this requirement for tailoring came from, and he cited a study that was—that had been conducted by the Defense Science Board.

I got a copy of that study from the Defense Science Board, the only justification for tailoring that we have, and lo and behold, when I look at the list of members of the task force, the Defense Science Board, we have Dr. Richard Stimson and a whole raft of industry executives, and a few other people from the procurement community inside the Department of Defense. And among other things, they suggest that DOD should encourage and continue to avail itself of support from industry organizations by formalizing channels of communication and providing higher echelon management review points of agreement, disagreement.

They get the inputs directly from the industry, just as our major procurement commands do, and seem to be taking their marching orders from them. I cannot say that with certainty but it certainly appears that way to those of us who are trying to do it right.

Just this morning, Mr. Chairman, I was handed a letter in which the Secretary of the Air Force wrote to the Chief of Staff, saying, with respect to the unfortunate addition and uncoordinated addition of language put on by the Secretary of Defense's Office—I will quote from it.

> However, in reviewing Military Standard 1567A, I have concluded that we would be better served to delete the last half of the forward following subparagraph K.

That is the part that invites tailoring and has caused us so much difficulty.

To continue the quote:

> With this modest amendment we will be strengthening the Air Force application of this regulation controlling the use of work measurement.

And then he goes on to say regarding the second point in Mr. Chauhan's letter, or the letter that Mr. Chauhan produced from the Hughes Co., on their preference for using actual times.

> By steadily improving manufacturing activity, we've reduced the direct manufacturing labor content to which work measurement standards apply. This may decline even further with advanced manufacturing technologies like robotics. Nevertheless, direct manufacturing labor remains a significant cost of weapons procurement. We have labored too long under a pricing system where historical actuals rather than "should cost" assessments have been the basis for negotiations.

This is encouraging.

Senator **Grassley**. Now let me clarify. Is this memo from the Secretary of the Air Force then, a response, because Mr. Chauhan yesterday disclosed that memo that he had?

Mr. **Fitzgerald**. I do not know. I do not know. It was just handed it by——

Senator **Grassley**. Well, what do you think?

Mr. **Fitzgerald**. Well, I would certainly hope so. You know, anyone reading that letter would certainly see through the facade of footdragging and pettifogging that we have encountered in trying to put through this simple requirement, and I would hope, if that were brought to his attention, that he would have reacted that way.

But I hope that this will start the ball rolling in the right direction, so that we can put this, the nonsense part of this behind us, because we have enormous opportunities, Mr. Chairman, to capture savings in our, especially our giant programs.

As I testified last year, and I think Mr. Chauhan did, the savings could be 30 percent of the acquisition budget for the major programs.

I base that on hard experience running "should cost" studies in the past when I was allowed to run them directly.

When the programs were much less fat than today, we were able to get 30 percent negotiated out; that does not mean that is all the fat that was there. That is what we could negotiate out.

We could do that again.

Senator **Grassley**. Go ahead.

Mr. **Fitzgerald**. I have completed my remarks and am available for questions.

Senator **Grassley**. You are a recognized expert in the area of work management and time standards. You also have guidance and direction and responsibilities in this area in the Air Force, and I believe that is both by court order and by some sort of an agreement with the Air Force.

Mr. **Fitzgerald**. Yes, sir; that is correct.

Senator **Grassley**. Is the Air Force living up to its agreement?

Mr. **Fitzgerald**. As of yet, no, sir.

Senator **Grassley**. Well, elaborate for me on that. To what extent they are not living up to the agreement?

Mr. **Fitzgerald**. I have had my guidance and direction countermanded on occasion, and particularly with respect to the work measurement applications. We have had great difficulty getting direct access to information on occasion as well, which is also guaranteed by our agreement.

Senator **Grassley**. The extent to which you have any evidence in writing, I would like to have that for the record. Do you have any?

Mr. **Fitzgerald**. Yes, sir. I have—during your staff's continuing investigation, they asked for and received from my files a recent example where my direction to the air staff and the commands was countermanded, unbeknownst to me, as it turns out.

Senator **Grassley**. OK. Proceed. Well, before you—well, in your elaboration, explain just a little bit about what you just said.

Mr. **Fitzgerald**. Well, as part of my difficulty in finding out what was going on, I encountered just a stonewall of opposition from the buying command, the major buying command, on what communication they were having with industry.

I knew that there were big confabs being held, aimed at frustrating the intent of our work measurement drive, that communications had been going on directly through our field organization, procurement activities, and the Office of the Secretary of Defense. And so when I was told that it was none of my business what the discussions with industry were, I simply withdrew an earlier delegation of tailoring authority, waiving authority that I had made to the field in 1983, by agreement with then Assistant Vice Chief of Staff Driessnak.

And I learned belatedly, when nothing happened, that my directions had been countermanded by the assistant vice chief of staff, a memorandum sent out saying, "Disregard this information" to the air staff.

Senator **Grassley**. It sounds like you run into the same sort of problems with your court order, and getting information, as I do as a U.S. Senator trying to represent——

Mr. **Fitzgerald**. Well, I think my difficulties are somewhat greater than yours, Senator, if I may; although, I will say, that when you did write directly to me asking for the work measurement data, and I forwarded your letter to the staff and the commands, that we got a moderately good response, certainly much better than was obtained going through the OSD channels.

And I sent that through the same assistant vice chief of staff, and as I say, got a moderately good response, I think primarily because it was a congressional request. My own requests are often ignored.

Senator **Grassley**. Are you done?

Mr. **Fitzgerald**. Yes, sir, that is the end of the question, or my answer to it, at least.

Senator **Grassley**. How can "should cost" or "should take" information be useful in managing a defense contract, and what does it tell you?

Mr. Fitzgerald. Well, in addition to telling us how much fat there is in the manufacturing effort, it provides us early warning.

Now contrary to what you have been told by, or suggested by some of the witnesses who look with disfavor upon this approach, we find—Dr. Amlie and I especially—that the use of the very kind of information that you are requesting, bills of labor and bills of material, are extremely enlightening.

I have here, just to wave around primarily, but you can examine if you like, the bill of material and the bill of labor on the Amram missile. Now it looks like a huge heap of paper and it is, but that represents somewhere between $8 and $20 billion worth of Amram Missile Program.

All the other numbers that the cost estimators employ are markups on these two figures. As I understand your amendment, you would only want the top line in the bill of labor and bill of material, but we have—we have been able us use this——

Senator Grassley. Repeat that.

Mr. Fitzgerald. Sir?

Senator Grassley. Repeat that.

Mr. Fitzgerald. Yes. My understanding, my reading of your amendment, is that you would only want for the, for what we call the air vehicle, the flyaway unit, the missile itself—you would only want the top line on this.

Senator Grassley. Now would it take millions of dollars to collect that as Members of Congress have been led to believe by people in industry and DOD, who do not want the amendment adopted?

Mr. Fitzgerald. Of course not; of course not. We would hope that your amendment means, when you say "cause to be recorded," that we could—that could include having to record it in the contractor's computer, and when we ask for it, to spit it out.

This is exactly the way we got this. Dr. Amlie, a year and a half ago, after he had been told that the price of the Amram missile was $78,000, in 1978 dollars, with some disbelief traveled to the location of the contractor who was designing the thing, asked them to spit out the similar data, and found that we in fact had a missile that, if all else remained the same——

Senator Grassley. Was that how Mr.——

Mr. Fitzgerald [continuing]. Would cost over $800,000, not $78,000.

Senator Grassley. Was that how Mr. Hooper was able to do his study of Hughes and the five other plants involving that information?

Mr. Fitzgerald. No, sir. I do not believe he got this information. And in actuality, the efficiency part of the study that Mr. Hooper spoke about at Hughes was done by Mr. Chauhan.

I do not believe, I do not know whether Mr. Chauhan had access to this or not, but he no doubt had access to a summary of it.

But Dr. Amlie, being one of the foremost missile designers around, found that he could make good use of the bill of material data, contrary to what detractors have said. We have not concentrated entirely on factory labor.

You may recall when I testified here last year, and showed you the absolutely horrendous results that we had found at Hughes, and Mr. Chauhan had verified and elaborated on, that the abysmal factory efficiency was the "good news."

The "bad news" was that that represented a tiny fraction of the cost, and that the waste in the non-factory areas appeared to be even greater.

But we would like to get at it, we have made attempts to get at it, but that does not mean that the factory is not important, and that the bill of material, which no one has mentioned in your bill, is equally useful. Dr. Amlie has come up with suggestions which we think have the potential of cutting the bill of material in half.

Senator **Grassley**. Would we be able to get at that through my amendment?

Mr. **Fitzgerald**. Yes, sir. It would help us; it would help a great deal.

Needless to say we have considerable difficulty getting at this in the normal course of events. I think with—not only would the Congress be able to get the top line, or the total figure on this, or any subdivision thereof that they wished, but no one—you know—I do not believe the bureaucracy could then deny it to us, either.

Now we do not want to get this all the time, let me make that clear. All we want to do is have it available when we are tasked to dig into a program to see it, in the case of a maverick, we can save it, or do something about the run-away cost. Whatever.

Senator **Grassley**. Could you give the committee some examples where this information, as would be required by my amendment, would have helped identify past cost overruns before they occurred?

Mr. **Fitzgerald**. Oh, sure. I think it would have helped on all of the small missile programs and all the aircraft programs, such as the F-18, had the Navy had such data. It would—a lot of times the data is available, but it is not made use of by the services because they do not understand how to use it.

It was available on the Maverick missile, which was such a disaster for us, but at least in cost.

Senator **Grassley**. Let me ask you one more question, and I did not anticipate having to go vote, but I was going to get done here before 1:00, because I have a bill on the floor at 1:00. So I am going to ask one more question, and then I will probably have to submit some in writing.

Mr. **Fitzgerald**. OK.

Senator **Grassley**. I am sorry. Based upon your experience in collecting and analyzing this information, how difficult is it for DOD to obtain this type of information—you know—the "should take" times, and the standard hour cost estimates, from defense contractors?

Mr. **Fitzgerald**. I think if we, if we make a united front, show a united front to the contractor, that is, if we are not undercut, those of us in the civilian areas, not undercut by the military staff——

Senator **Grassley**. Are the barriers from DOD, from the defense industry, or from where?

Mr. **Fitzgerald**. Our biggest barrier is the military staff, Senator.

Senator **Grassley**. OK

Mr. **Fitzgerald**. If we can get past that, I think the contractors can be handled.

Senator **Grassley**. Would you elaborate on that in writing for me.

Mr. **Fitzgerald**. Yes, sir. I will be glad to.

Senator **Grassley**. Did I give you enough time to answer my question? I interrupted you.

Mr. **Fitzgerald**. Yes, sir. To just react generally, I think the amendment will be very helpful to us. I do not think that it is accurate to say that we do not collect actual cost, as Ms. Gilleece said. I furnished your staff with a large spreadsheet showing the financial systems, which I do not believe they have given any thought to, showing the names of the systems, and the type of data collected on each one of them.

Actually, we have far more systems collecting actual costs than we really need, contrary to what Ms. Gilleece said.

Senator **Grassley**. OK. Well, I would like to include all the documents referred to into the record and I would like to thank you, Mr. Fitzgerald for your cooperation and testimony.

[The statement follows:]

PREPARED STATEMENT OF A. ERNEST FITZGERALD

MR. CHAIRMAN, MEMBERS OF THE SUBCOMMITTEE:

THE USE OF WORK MEASUREMENT TO PRODUCE LABOR TIME STANDARDS IS A GENERALLY ACCEPTED APPROACH TO EVALUATE OBJECTIVELY PROPOSED OR ACTUAL LABOR PERFORMANCE. AIR FORCE COST MANAGEMENT POLICY INCLUDES ENCOURAGING, SOMETIMES REQUIRING, CONTRACTORS USE OF EFFECTIVE WORK MEASUREMENT SYSTEMS FOR "TOUCH" LABOR, THAT IS, HANDS-ON MANUFACTURING AND TEST LABOR.

TO CLARIFY, THE OFFICIAL DOD DEFINITION OF THE WAY A TIME STANDARD IS BUILT UP IS TO USE GENERALLY ACCEPTED INDUSTRIAL ENGINEERING PROCESSES TO DEVELOP NORMAL TIMES FOR SPECIFIED TASKS, THEN TO ADD ALLOWANCES TO THOSE NORMAL TIMES TO ALLOW TIME FOR THE WORKERS TO TAKE CARE OF PERSONAL NEEDS, TO REST, AND TO ACCOMMODATE UNAVOIDABLE DELAYS. THE OFFICIAL DOD DEFINITION IS:

> "NORMAL TIME IS THE TIME REQUIRED BY A QUALIFIED WORKER TO PERFORM A TASK AT A NORMAL PACE TO COMPLETE AN ELEMENT, CYCLE, OR OPERATION USING A PRESCRIBED METHOD. THE PERSONAL, FATIGUE, AND UNAVOIDABLE DELAY ALLOWANCE ADDED TO THIS NORMAL TIME RESULTS IN THE STANDARD TIME." (MIL-STD 1567A, WORK MEASUREMENT, MARCH 11, 1983).

PLEASE NOTE THAT THE DEFINITION IS BASED ON A "PRESCRIBED" METHOD. IN PRACTICAL TERMS, THIS MEANS THAT THE TOUCH LABOR NORMAL AND STANDARD TIMES WILL BE BASED ON METHODS IN USE AT ANY GIVEN POINT IN THE EVOLUTION OF A MANUFACTURING PROJECT. THIS MEANS THAT OUR CONTRACTORS SHOULD MAINTAIN THEIR TIME STANDARDS BASES TO REFLECT CHANGING CONDITIONS AS THE DESIGNING, MANUFACTURING AND TESTING PORTIONS OF A PROGRAM PROCEED THROUGH THEIR PHASES.

THE APPLICATION OF DISCIPLINED WORK MEASUREMENT SYSTEMS WILL AID THE ACHIEVEMENT OF IMPROVED PRODUCTIVITY THROUGH THE IDENTIFICATION OF UNECONOMICAL DESIGNS, EXCESS MANPOWER, LOST TIME, AND INEFFICIENT METHODS. A RESPONSIBLE AND RESPONSIVE CONTRACTOR WILL HAVE A STRUCTURED, DISCIPLINED WORK MEASUREMENT SYSTEM FOR PLANNING AND CONTROLLING HIS MANAGEMENT AND MANUFACTURING RESOURCES COST. ITS PURPOSES ARE (A) TO HELP DOCUMENT THE EMERGING UNIT COST OF MANUFACTURING DURING DESIGN, (B) TO ESTABLISH STANDARDS FOR RESOURCE VARIANCE ANALYSES, (C) TO IMPROVE METHODS, (D) TO MEASURE AND IMPROVE LABOR EFFICIENCY, (E) TO AID CONTRACT PERFORMANCE MEASUREMENT, (F) TO IDENTIFY EXCESS MANPOWER, LOST TIME, AND INEFFICIENT METHODS, (G) TO ESTABLISH THE BASE FOR DEVELOPING COST PROPOSALS, AND (H) TO PROVIDE THE OPERATIONS COST DATA IN SUPPORT OF DESIGN TO COST, LIFE CYCLE COST, SHOULD COST, MAN TECH, AND VALUE ENGINEERING EFFORTS.

THE AIR FORCE SECRETARIAT IS PUTTING SPECIAL EMPHASIS ON THE USE OF BILLS OF LABOR PRICED IN STANDARD HOURS, ALONG WITH BILLS OF MATERIAL PRICED IN DOLLARS, TO IDENTIFY THE EMERGING UNIT COST OF MANUFACTURING AS EARLY AS POSSIBLE. WITH THE RAPIDLY IMPROVING PREDETERMINED TIME STANDARD SYSTEMS NOW AVAILABLE, WE ARE FINDING THAT WE CAN GET A USEFUL HANDLE ON WHAT COMPLEX ITEMS SHOULD COST IN LABOR AND MATERIAL MUCH EARLIER THAN HAS BEEN THE USUSAL PRACTICE. THIS APPROACH IS ALREADY SHARPENING OUR EARLY WARNING SYSTEMS. AS OUR PEOPLE LEARN MORE ABOUT THIS APPROACH, WE BELIEVE THAT OUR TAXPAYERS AND OUR OPERATING FORCES WILL REALIZE SIGNIFICANT BENEFITS.

MY OFFICE IS RESPONSIBLE AT THE HIGHEST AIR FORCE LEVEL FOR POLICIES AND PROCEDURES REGARDING, AMONG OTHER THINGS, PERFORMANCE MEASUREMENT, COST CONTROL AND REDUCTION. THIS INCLUDES DEVELOPMENT OF NEW SYSTEMS AND IMPROVEMENT OF CURRENT SYSTEMS FOR COST CONTROL AND COST REDUCTION, FOR APPLICATION OF "SHOULD COST", AND RELATED ANALYSES AND SYNTHESIS TECH-

NIQUES FOR AIR FORCE COST ESTIMATING, AND FOR AIR FORCE ECONOMIC COST EFFECTIVE ANALYSIS. THE READY AVAILABILITY OF RELIABLE UP-TO-DATE WORK MEASUREMENT INFORMATION WILL GREATLY IMPROVE OUR ABILITY TO CARRY OUT THESE RESPONSIBILITIES.

ON 10 APRIL 1985 THE SECRETARY OF THE AIR FORCE, AT THE REQUEST OF MR. RICHARD E. CARVER, ASSISTANT SECRETARY OF THE AIR FORCE (FINANCIAL MANAGEMENT), APPROVED A PROJECT DESIGNED TO IMPROVE THE AIR FORCE'S ABILITY TO DEAL WITH COST MANAGEMENT. IT IS MY RESPONSIBILITY TO LEAD THIS EFFORT WHICH WILL INOLVE AMONG OTHER THINGS NOT ONLY IMPROVEMENT IN THE USE OF ADP, BUT THE INSTITUTIONALIZING OF COST TRACKING TO INCLUDE WORK MEASUREMENT.

Senator **Grassley**. It is quite clear to me that the Defense Department has not acted with much credibility on this whole issue of work measurement.

The fact it has been talked about for 20 years but that little has come of it, as a DOD-wide effort, I think speaks for itself.

The Defense Department has lost points on this issue in terms of debate, responding to Congress, and upholding its responsibility in the information flow process.

I am satisfied that we have cleared up any notion that work measurement is neither relevant nor currently used in the defense industry.

There are still some questions that remain, however. To what degree is the defense industry needlessly inefficient?

Has the Defense Department policy been unduly influenced by the defense industry on the issue of work measurement?

And was there a conflict of interest in the specific case of the head of the Office of Acquisition Management?

The subcommittee has instructed the staff to conduct further investigation into these matters with a report due November 1.

The subcommittee will also formally ask the DOD Inspector General to investigate a possible conflict of interest based on today's testimony and other factors. The meeting is adjourned.

[Whereupon, at 12:40 p.m., the subcommittee was adjourned.]

APPENDIX

ADDITIONAL STATEMENT FOR THE RECORD

PREPARED STATEMENT OF SENATOR HOWELL HEFLIN, THE NEED FOR LABOR STANDARDS AND WORK MEASUREMENT IN THE DEFENSE INDUSTRY

Mr. Chairman, today the subcommittee focuses on the subject of labor standards and work measurement in the defense industry. For the record, work measurement is the technique used to determine the time a typical well-trained worker requires to perform a repetitive task or unit of work of specialized quality using prescribed methods; under given conditions; when properly supervised and supplied with specific tools, materials, and other necessities; and when he or she works industriously at a pace that can be maintained, day after day, without harmful physical effects.

Although there is perhaps a general tendency to think of time and motion studies mainly as attempts to increase the productivity of the direct labor force, they actually are of much more general utility and importance. For example, the resulting information, data, and knowledge provide not only a rational basis for critiquing and improving work methods through logical analysis and synthesis, but also for cost/price estimating, achieving a more uniform, higher quality product, reducing indirect and other costs, and, in general, increasing the productivity and profitability of the overall operation.

Time standards are widely used throughout industry, both defense and commercial, and are the best available tools for measuring output efficiency. They can and should be applied uniformly throughout the defense industry. It is quite apparent that the Department of Defense Management knows little if anything, about the useful application of time standards to defense industry manufacturing.

The central premise behind the push for the use of the work measurement concept in defense industry manufacturing is that we should base what we pay for weapons systems *not* on extrapolations of what they have been costing in the past for identical or similar type work; rather we should base what we pay for these systems of what they *should* cost in a commercially competitive atmosphere. The former methods clearly allow waste and inefficiencies to perpetuate themselves in a closed atmosphere of extremely limited competition.

Labor performance indices that do exist for defense production programs are disturbingly high. This is true for both old and new production systems characteristic of both high and low production rates. The average cost per standard hour for producing most defense weapons systems ranges from one to twenty times the corresponding cost done for work done of similar type work in the commercial sector.

Normal day work labor efficiency in commercially competitive manufacturing plants averages 85% or better; the average rate for defense contractors averages 30% with many contractors operating well below that level. Such a situation exists largely due to management's absence of motivation to minimize total production costs. In short, defense contracts are put in the abnormal situation of justifying costs, not price.

Industrial engineering standards *do* exist for the type of work done in defense contract plants and are used by contractors to form bases for contract bids to the Defense Department. To argue that work measurement systems cannot be constructed for complex, technologically advanced work characteristic of defense work, shows a lack of understanding of modern applications of industrial engineering standards. It is the work *task* and work *process* that is measured, not the resulting product. Methods levels can be constructed which take into account numerous extraneous factors.

Labor efficiency data is kept by almost all contractors in some form and fashion. This data can be made available to DOD officials upon request as part of the contract negotiations process as explained in the defense procurement regulations. I repeat: this information is presently available; there is no requirement to generate new information or needless paperwork.

Current non-use of actual standard labor hour data perpetuates a pervasive incentive in defense industry contracting: higher labor charges stem higher overhead and administrative charges due to calculation procedures.

All the numbers, charts, and graphs show that defense funds have fallen short—often far short—of their own standards for efficient production of a wide range of weapons systems and components. The data in previous reviews of defense industry costs and standards undertaken by the air force systems command show that the industry is plagued with serious inefficiencies and has little incentive to control costs that it can pass along to the government.

A simple, little metal strap which holds engine wires in place on the KC-135 airplane illustrates an all too familar situation. The cost per standard hour of output for that strap was $370. That is $370 per standard hour of work. The commercial industry could do the same kind of work for about $50 per standard hour. The cost per standard hour on that strap is about 7.5 times more than it should be.

Few dispute that the ratings are a useful procedure to assess productivity in an industry that has experienced significant growth as a result of our recent military buildup. Over the past four years, the pentagon's procurement budget has more than doubled when measured in constant dollars: it stands at 96.8 billion dollars for fiscal year 1985.

As I mentioned earlier, some contracts actually provide a perverse incentive not to reduce labor charges because some of the charges, such as overhead and administration, are assessed at the percentage of the total direct labor costs. A large number of labor hours makes sizeable overhead costs appear more reasonable.

Outside the industry, the notion of work measurement standards is generally well received. The general accounting office blessed the concept in a 1980 report concluding that the use of such standards could increase labor productivity by 10–30% and reduce weapons costs by as much as 5%.

A mid-1983 study by the air force systems command, of six major contractors producing 35 systems showed that the average efficiency rating for defense production labor was 46%. That means contractors generally took more than twice as many hours than they calculated they would need to produce the weapons systems. If you go to regular competitive (nondefense) industry, you find efficiency close to 95%. Of the 35 systems surveyed by the air force systems command, only 5 had an efficiency rate of 70% or better.

Some Pentagon and industry officials claim that this inefficiency is due to the fact that most defense systems are produced in relatively low volume and are subject to frequent engineering changes. However, work standards can be devised to take into account low production rates and "learning curves"—the assumption that production becomes more efficient with time and volume. The real problem seems to be that the contractors have got too many people to accomplish the work that needs to be accomplished. The ratings are a device for raising concern about the complex weaponry whose costs can not be evaluated as intuitively as that of a plastic stool cap or wrench. Contracts should be based on what one should pay in the commercial environment without reference to what was necessary in the past. Work standards could be used to help identify inefficiencies in the work production process.

Derrek J. Vander Schaaf, the Pentagon's deputy inspector general, has said that a recently completed audit by his office has shown that "should cost" estimates that include measurement were useful in negotiating more favorable contracts. I agree wholeheartedly with Mr. Vander Schaaf; however, it is time to go beyond what we "should" do and do it!

I have long been an advocate of more competition in defense procurement, but there are also many other steps that should be taken to increase the efficiency and productivity of the manufacturing operations of defense industries. One that is only beginning to receive effective attention within the services is that of directly assessing and monitoring the efficiency of these operations; and of insisting upon the obtainment of higher levels of efficiency, controlling unrelated and indirect "mark-up charges."

It is high time that Congress vigorously support initiatives to identify and address the inefficiencies in defense manufacturing operations by driving to establish and attain work standards quickly. Common sense tells us that paying 10 to 20 times what something is worth is no way to run a business, and certainly no way to protect and ensure our national security.

Thank you, Mr. Chairman.